3589-89-I-DOE-159

Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

cc: R. E. Hlavacek
K. M. Greenwell
R. L. Ackaret
R. A. Nelson
S. D. Anderson
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J. C. Langford
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M-K FERGUSON CO.
RECEIVED
MAY 10 1989
WSSRAP CONTRACT 3589

May 09, 1989

ADDRESSEES

PROPOSED MANAGEMENT OF 15 NONPROCESS BUILDINGS AT THE CHEMICAL PLANT

Enclosed for your immediate review and comment is the "Engineering Evaluation/Cost Analysis for the Proposed Management of 15 Nonprocess Buildings (15 Series) at the Weldon Spring Site Chemical Plant".

Any comments should be provided by June 2, 1989.

Sincerely,

For R. R. Nelson
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosure:
As stated

cc w/enclosure:
G. Turi, NE-23 (3 copies)
B. Manning, CE-50 (1 copy)
W. Hibbitts, SE-31
A. Avel, CE-53
B. Hlavacek, PMC
J. Peterson, ANL

Document Number: I-1000-1003-1.01

~~00624~~

LIST OF ADDRESSEES FOR LETTER DATED MAY 09, 1989

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Mr. David E. Bedan
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DOE/OR/21548-136

ADDENDUM TO ENGINEERING EVALUATION/COST ANALYSIS FOR THE PROPOSED MANAGEMENT OF 15 NONPROCESS BUILDINGS (15 SERIES) AT THE WELDON SPRING SITE CHEMICAL PLANT, WELDON SPRING, MISSOURI

by

Margaret M. MacDonell and John M. Peterson

Environmental Assessment and Information Sciences Division

August 1990

work supported by

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

INTRODUCTION

An engineering evaluation/cost analysis (EE/CA) report was prepared in May 1989 to analyze alternatives for a proposed removal action to manage 15 nonprocess buildings, designated as the 15 Series buildings, at the chemical plant area of the Weldon Spring site (MacDonell and Peterson 1989). The alternative selected as a result of the analyses was to dismantle the buildings and to salvage or transport off-site for treatment or disposal all nonradioactively contaminated materials and to store on-site in a material staging area (MSA) all radioactively contaminated materials, pending a decision for disposal of all wastes resulting from remediation of the Weldon Spring site. Region VII of the U.S. Environmental Protection Agency (EPA) and the state of Missouri concurred with the selection of this alternative and provided comments on the EE/CA report. The proposed removal action was not initiated at that time due to funding constraints. This addendum has been prepared to (1) update information provided in the EE/CA report, (2) provide additional information on the MSA, and (3) respond to EPA Region VII and state of Missouri comments on the EE/CA. This addendum supports the close-out of the CERCLA review process for this action.

The 15 Series buildings addressed in the EE/CA report are Buildings 104, 302, 412, 413, 415, 417, 428, 433, 435, 436, 437, 438, 439, 441, and 443 (see MacDonell and Peterson 1989, Figure 2, for the locations of these buildings). Although none of these buildings was used for the direct processing of radioactive materials, some became radioactively contaminated during the operational period of the chemical plant or following plant closure. During the operational period, contamination may have occurred as a result of (1) routine plant operations (e.g., tracking of contaminants from process areas and temporary relocation of contaminated equipment for repair), (2) processing support activities (e.g., waste handling), and (3) surficial deposition of airborne particulates. Following plant closure, contamination may have occurred as a result of (1) relocation of some contaminated equipment from process buildings into nonprocess buildings during cleanup activities and (2) transport of contaminated materials by environmental factors (e.g., wind) and local biota (e.g., wasps that built nests with contaminated mud).

A general description of the 15 Series buildings is given in Table 1 of this addendum. Several corrections have been made in this table regarding the building dimensions given in the EE/CA report. An inventory of the contents of these buildings is currently being prepared. This information is being included in the Waste Inventory Tracking System (WITS). This data base, which will be continually updated as the project proceeds, provides a systematic mechanism for managing the contents of these buildings. The information given in the WITS data base and two characterization reports (MK-Ferguson Company and Jacobs Engineering Group 1990a, 1990b) provide a thorough description of the contamination associated with these buildings. This information is sufficient to thoroughly plan and implement the proposed removal action.

TABLE 1 General Description of the 15 Series Buildings

Building	Structure[a]	Past Use	Equipment Content
104	29-ft × 18-ft × 13-ft metal base with concrete floor; 10-ft diameter, 30-ft steel hopper; upper 15-ft × 15-ft × 20-ft prefabricated steel shed	Store and distribute lime as slurry for raffinate neutralization	Pump, motor, metal bin, and electrical/mechanical instruments
302	One-story structure with a 28-ft × 49-ft × 30-ft process area, 82-ft × 74-ft × 10-ft warehouse, 12-ft × 12-ft × 12-ft battery charging area, and 8-ft × 6-ft × 12-ft restroom; concrete floor and concrete block construction with steel frame and flat, built-up roof	Pelletize and store drums that contained magnesium chips and process and repackage the magnesium	Process hopper, magnetic separator beams and columns, sampler drums, carbon plates, iron cartridges, cabinets, lighting and heating equipment (e.g., water heater and steam pipes), and restroom fixtures
412	50-ft × 23-ft × 13-ft structure with concrete floor, concrete block construction with steel frame and built-up roof on poured concrete deck; contains small office and meter room	Electric substation to transform incoming power for distribution to secondary substations at the plant	Valves, pumps, motors, wooden boxes, and a fire hose

TABLE 1 (Cont'd)

Building	Structure[a]	Past Use	Equipment Content
413	30-ft × 90-ft × 22-ft redwood cooling tower; 90-ft × 40-ft × 5-ft concrete collection basin, a 92-ft × 3-ft flume on the west side, and an adjacent 29-ft × 50-ft × 24-ft steel frame building with corrugated asbestos siding and concrete floor	Recirculate cooling water and house pumping/chemical treatment facilities	Water treatment equipment, steam heaters, gauges, valves, pumps, motors, an exhaust fan, and a fire hose
415	6-ft × 10-ft × 7-ft brick incinerator supported by a steel frame	Incinerate process wastes	None
417	67-ft × 32-ft one-story steel frame and concrete block structure with concrete floor and flat, poured gypsum concrete roof deck; three sections: general work area, spray painting booth, and flammable material storage area	Maintain and store equipment, conduct spray-painting operations, and store flammable materials and paint cans	Cabinets, lockers, work benches, tables, chairs, barrel stands, steam heaters, and a fire hose
428	24-ft × 14-ft × 16-ft structure with corrugated transite siding	Supply fuel gas (propane-air mixture) to various buildings for process heat	Electric pumps, compressors, and condensors

TABLE 1 (Cont'd)

Building	Structure[a]	Past Use	Equipment Content
433	40-ft × 182-ft × 24-ft one-story steel beam frame with prefabricated sheet metal panels and a concrete slab floor; attached 13-ft × 14-ft × 11-ft concrete structure	Store maintenance vehicles and smaller mechanical equipment	Tractors, forklifts, trucks, automotive parts, scaffolding, bricks, barrels, scales, work benches, shelves, hardware and plumbing supplies, hoses, buckets, tools, and small machine parts
435	150-ft × 40-ft × 20-ft Butler building with prefabricated sheet metal panels and concrete floor	Store water-treatment chemicals and miscellaneous mechanical parts	Cabinets, work benches, tables, shelves, pallets, space heater, fume hoods, ovens, map stand, and various pieces of furniture and electrical, sampling and safety equipment
436	200-ft × 40-ft × 23-ft Butler building with steel frame and prefabricated panels and concrete floor; small restroom and enclosed office at south end	Store general items	Freezers, motors and machine parts, lab fixtures, pipe fittings, crates of cast metal, bins of firebrick, ladders, and various pieces of furniture
437	70-ft × 33-ft × 15-ft one-story brick structure with concrete foundation and floor and flat, built-up roof; seven rooms	Store documents (originally an ordnance works building)	Furnace, file cabinets, boxes of rock core, broken furniture, and other debris

TABLE 1 (Cont'd)

Building	Structure[a]	Past Use	Equipment Content
438	102-ft × 40-ft × 16-ft structure, with 300-ft^2 × 10-ft office, steel beam frame construction with prefabricated steel panels and concrete foundation and floor	Store general items (originally a construction-support building)	Process hoppers, electrical equipment, boxed insulation, file cabinets, office furniture, and scale models of chemical plant buildings
439	14-ft × 14-ft × 15-ft steel beam frame structure with metal panels and a concrete floor	Train employees in safety and fire protection (classroom setting)	Various debris, including charred wood and tires
441	20-ft × 60-ft × 20-ft structure with steel support columns, corrugated aluminum roof, concrete floor, and 8-ft × 60-ft ramp to the loading dock	Store cylinders of compressed gas prior to their transport off-site	Fencing and steel/cinder-block cylinder racks
443	24-ft × 15-ft × 8-ft one-story wooden shed with shingled roof and wooden floor on a concrete slab	Store fire-protection equipment	Wood-burning stove and three desks

[a]Conversion factors: to convert feet (ft) to meters (m), multiply by 0.3048; to convert square feet (ft^2) to square meters (m^2), multiply by 0.0929.

DESCRIPTION OF THE PROPOSED ACTION

The alternative selected in the EE/CA report was to dismantle the 15 nonprocess buildings and to salvage or transport off-site for treatment or disposal all nonradioactively contaminated materials and to store on-site in the MSA all radioactively contaminated materials. This action is being modified to include temporary storage on-site of all nonsalvageable or contaminated materials associated with dismantling these buildings; most of these materials will be stored in the MSA. The materials will be sorted into potentially releasable and nonreleasable materials at the MSA. (Releasable materials are those that can be managed or utilized without restrictions due to radioactive or chemical contamination.) This will allow for efficient characterization to be performed prior to a decision on their ultimate disposition. The only materials that will be transported off-site as a part of this action are uncontaminated salvageable materials. This action includes the following sequence of activities:

- Manual decontamination of all radioactively contaminated surfaces (e.g., by aggressively vacuuming/wiping equipment exteriors and building interiors/exteriors), with containment and storage on-site of all radioactively contaminated materials at the MSA;
- Removal of all materials contaminated with polychlorinated biphenyls (PCBs) (e.g., using a solvent wipe procedure), with temporary storage in Building 434 along with the site's containerized chemicals, pending subsequent transport off-site of all nonradioactively contaminated materials to an approved treatment/disposal facility and containment and continued storage on-site of any radioactively contaminated materials;
- Isolation of all asbestos-containing materials (e.g., in plastic bags), with containment and storage on-site;
- Follow-on decontamination of structural surfaces, as appropriate, to remove radioactive contamination;
- Dismantlement of all structures, with further decontamination of previously inaccessible surfaces during dismantlement;
- Removal of underground storage and septic tanks;
- Placement of all nonsalvageable or contaminated materials in the MSA; and
- Transport off-site of all uncontaminated salvageable materials.

The proposed activities are similar to those previously conducted at the chemical plant for dismantlement of the steam plant and administration buildings (Buildings 401 and 409, respectively). These buildings were dismantled in accordance with all applicable or relevant and appropriate requirements and procedures. Likewise, the 15 Series buildings will be dismantled in accordance with all such requirements and procedures. Dust-control measures, such as wetting and covering surfaces, will be employed to minimize particulate emissions during all activities associated with dismantlement. Air in the work area will be monitored for asbestos and radioactive particulates as part of a comprehensive detection and mitigation system. Asbestos- and PCB-handling activities will comply with safe practices and regulatory requirements. This compliance will ensure the protection of workers on-site and will limit the potential for contaminant releases off-site. In addition, the proposed dismantlement will preclude the adverse impacts on human health and the environment that could result from further building deterioration.

Airborne gross alpha activity was measured in the work area during dismantlement of Buildings 401 and 409 as well as during removal of overhead piping. The measured concentration was generally less than 1×10^{-13} µCi/mL, whereas the derived air concentration (DAC) for controlling radiation exposures to workers at DOE facilities is 2×10^{-11} µCi/mL for uranium isotopes. This demonstrates the effectiveness of procedures used to control airborne emissions. Similar controls will be used for the 15 Series buildings.

The 15 Series buildings will be dismantled following cleanup of the removable contamination from building surfaces. All activities and results associated with the radiological characterization, decontamination, and dismantlement of the buildings will be subjected to independent verification. In addition to reviewing sampling procedures and results, the independent verification contractor (Oak Ridge Associated Universities) will visit the site both during and after the dismantling effort to ensure that all activities are conducted in a safe and effective manner.

At-grade or below-grade materials that remain following building dismantlement will either be decontaminated and removed or left in place pending future decisions for remediation of the chemical plant area. In general, the floors of the buildings that are radioactively contaminated contain (1) loose dust deposits, which could be removed by aggressive vacuuming and/or (2) limited, fixed contamination, which could be removed by scarifying (measured radioactivity is at background levels within 2 cm [1 in.] of the surface [MK-Ferguson Company and Jacobs Engineering Group 1989]). Materials that remain in place will be surface-sealed or otherwise protected, as necessary, to limit the potential for any contaminant release to, or exposure to contaminants from, the local environment.

Four of the 15 Series buildings (i.e., Buildings 435, 436, 437 and 438) are located within the area that will be used to construct the temporary storage area (TSA) to support the quarry bulk waste remedial action (see Argonne National Laboratory 1990, Figure 8.8). These buildings and their foundations will be removed to allow construction of the TSA. In addition, drawings have recently been discovered indicating the presence of several underground storage and septic tanks in this area. The existence and location of all tanks in the chemical plant area have not been verified. The proposed action is being expanded to include removal of underground tanks in the chemical plant area along with removal of the foundations of the four buildings.

A work plan will be prepared to define the procedures used to remove the underground storage tanks. This plan will include the locations and descriptions of all known tanks and describe the approach that will be used to characterize and excavate the tanks. The soil near suspected tank locations will be excavated to expose any buried tanks; soil in contact with the tanks will be sampled for contamination. This will allow for a visual inspection of the tanks and preparation of detailed sampling plans for the tank contents. The contents of the tanks will be removed, containerized, and transferred to Building 434 for temporary storage. The tanks themselves will then be removed, rendered inert, and transferred to the MSA for temporary storage. Any remaining contaminated soil will be remediated, if required, in the future when other contaminated soil at the chemical plant area is remediated.

The tanks will be removed in compliance with EPA technical requirements for management of underground storage tanks (40 CFR 280). All plans for removing the tanks will be sent to EPA Region VII and the state of Missouri for review and comment prior to initiating tank removal activities.

DESCRIPTION OF THE MATERIAL STAGING AREA

The MSA will be located in the northern portion of the chemical plant area (see MacDonell and Peterson 1989, Figure 2). This area has been studied extensively and has been determined to be relatively free of hazardous contaminants. A characterization report for this area is currently being prepared. Design criteria for the MSA have been developed to ensure the safe storage of waste materials associated with response actions at the chemical plant area prior to their final disposal. As originally envisioned, the MSA would be designed to store materials potentially subject to the Solid Waste Disposal Act, as amended (commonly referred to as the Resource Conservation and Recovery Act [RCRA]). However, based on updated characterization data and waste management planning, no RCRA wastes will be stored at the MSA. Thus, design criteria for the MSA have been modified such that a RCRA-type liner is not required.

The MSA will consist of three sections: one for known contaminated materials, one for known uncontaminated materials, and one for materials that must be analyzed further to determine if they are contaminated. Materials to be stored in the MSA include structural metal, equipment, concrete rubble, debris, and possibly soil. As currently envisioned, the MSA will be constructed in three phases, with the first phase initiated in 1990. The first portion of the MSA will be used for storage of materials associated with this action. The second and third phases of the MSA will be constructed in the future, if needed, to provide additional storage capacity for dismantlement of the remaining chemical plant buildings. The MSA is being designed to store a total of 72,800 m^3 (95,160 yd^3) of materials. However, the total volume of materials associated with this action is only a small fraction of the total design capacity.

The MSA will be designed to safely store these materials pending a decision on their ultimate disposition. A foundation will be prepared to ensure the structural stability of the MSA. The foundation must be able to support the wastes, cover materials, and any equipment used on the MSA. The MSA will be underlain by recompacted fine-grained soil to minimize the migration of contaminants into the nearby environment during the active life of the facility. The recompacted soil will cover all surrounding areas that could come into contact with contaminated materials and will be located above the seasonal high water table.

The MSA will be designed to minimize infiltration and encourage runoff. A runoff collection system will be installed immediately above the recompacted soil to collect and remove water from the MSA. Any collected water would be stored in a tank or surface impoundment prior to discharge or treatment in the water treatment plant planned for the chemical plant area, as appropriate. Any direct discharge would be through an existing permitted outfall; the existing permit would be amended, as required. A dike will be constructed around the active portion of the MSA to serve as both a surface water runon/runoff control system and a retaining wall. The dike will be designed to prevent surface water flow onto the active portion of the MSA resulting from a 25-year storm. Any materials subject to wind dispersal will be covered while in storage at the MSA.

The design of the MSA will be finalized during the detailed engineering phase. The MSA design will incorporate comments from EPA Region VII and the state of Missouri and will be constructed in compliance with all pertinent requirements.

COMMENT LETTERS FROM U.S. ENVIRONMENTAL PROTECTION AGENCY REGION VII AND MISSOURI DEPARTMENT OF NATURAL RESOURCES AND RESPONSES TO COMMENTS

Comments on the EE/CA report were received from EPA Region VII (June 16, 1989) and the state of Missouri (June 30, 1989). Both organizations agreed on the need for conducting this action but requested additional information on the procedures to be used to implement it. Some of the information requested by EPA has recently been published, e.g., building-specific characterization data are provided in MK-Ferguson Company and Jacobs Engineering Group (1990a, 1990b) and design criteria for the MSA are currently being developed. A copy of the comment letters and responses to specific comments are provided on the following pages.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

JUN 16 1989

Mr. Rodney R. Nelson
U.S. Department of Energy
Weldon Spring Site Remedial
Action Project
Route 2, Highway 94, South
St. Charles, Missouri 63303

Dear Mr. Nelson:

The Environmental Protection Agency (EPA) has reviewed the Engineering Evaluation/Cost Analysis for the Proposed Management of 15 Nonprocess Buildings (15 Series) at the Weldon Spring Site Chemical Plant dated May 1989. We are in agreement with the Department of Energy on the need for the proposed action; however, the following comments should be considered prior to implementation of the proposed action and/or in the development of plans for future interim response actions.

1. The subject document allows for general comment on the advisability of the proposed action; however, the document does not allow for a complete evaluation of whether the work will be performed effectively and in compliance with applicable guidelines.

A work plan should be developed that will reference building-specific monitoring data, and identify specific actions
EPA-1 planned for each building. The work plan should describe the sequence of proposed activities so as to minimize cross-contamination where possible (e.g., radioactive contamination of asbestos that could result from improper sequencing). Reasonable planning may reduce the amount of mixed waste generated by the cleanup activities.

The description of the proposed action does not include any procedures to be followed, but only an assurance that the action will conform to requirements. However, no specific commitment is

Response to EPA-1. The EE/CA report for the proposed management of the 15 Series buildings describes alternative strategies for managing these buildings, the anticipated environmental impacts associated with the alternatives, and the rationale for selection of the preferred alternative. The report documents the selection of the alternative and provides justification necessary for proceeding with the proposed removal action. This action will be performed consistent with DOE Orders for protection of workers, the general public, and the environment. These Orders have been developed to ensure compliance with all pertinent federal regulations.

As for previous building dismantlement activities, detailed work plans will be prepared for all phases of this action. These work plans will define the procedures to be used to dismantle the 15 Series buildings, including requirements for monitoring, worker protection, and management of contaminated and uncontaminated materials. Details on the various buildings and their existing levels of contamination are provided in supporting radiological and chemical characterization reports (MK-Ferguson Company and Jacobs Engineering Group 1990a, 1990b). An inventory of the contents of these buildings is included in the WITS data base. On the basis of these data and information currently being collected for the buildings and structures at the site, work plans can be prepared with sufficient detail to estimate the effort required and prepare for unanticipated occurrences.

The general sequence of activities to be followed was provided on page 21 of the EE/CA report; specific actions will be developed for each building based on the physical characteristics of the structure and the type of contamination present. Every attempt will be made, to avoid cross contamination by separately and sequentially decontaminating radioactively contaminated surfaces, removing all PCB-contaminated materials, and isolating and removing all asbestos-containing materials. If necessary, follow-on decontamination of structural surfaces will be performed to remove radioactive contamination. The activities will be performed in a manner to minimize the amount of mixed waste that may be generated.

The DOE has developed health and safety plans for the Weldon Spring project to ensure the health and safety of on-site personnel during the performance of response action activities. The plans include safety standards that must be met by all personnel and subcontractors. Key elements of these plans are the use of appropriate protective equipment and safeguards and the performance of specific tasks under the supervision of trained technicians and safety specialists. The DOE has also prepared an emergency response plan and a spill prevention control and countermeasures plan to specify procedures to be followed if accidents or emergencies do occur. These and other related plans provide a sound basis for conducting this action.

All reports associated with this action — including the EE/CA, this addendum, the characterization reports, and the work plans — will be available for EPA Region VII and state of Missouri review. In addition, all documents related to this action will be available for public review in the public reading room at the Weldon Spring site and the nearby information repositories.

made to conform with any specific requirements. The last paragraph on page 21 references dismantlement activities being conducted at the steam plant, Building 401. If applicable, the specific procedures and criteria controlling that work should be provided or referenced. If applicable procedures do not exist, they should be developed. The sequencing of cleanup activities, the criteria for cleanup, and the procedures to be used are essential elements to a complete estimate of the impact (occupational and environmental) and costs of the proposed action.

EPA-1 The proposed action does not identify contingency plans for use if contamination levels significantly in excess of the anticipated levels are encountered.

It is our understanding that the detailed work plan, containing the elements described above, will be developed by the selected subcontractor. We would appreciate the opportunity to review the plan prior to implementation of the proposed action.

Furthermore, we believe that in order to satisfy the public participation requirements of the EE/CA documentation process, the detailed work plan, as well as the subject document, should be made available for public comment prior to implementation of the work plan.

EPA-2 2. The intent of the document, in accordance with the EE/CA process, is to present and analyze alternatives to accomplish stated objectives. However, comparison of the stated alternatives does not appear to facilitate selection of a response action since there is no fundamental difference between the two alternatives (timing is the only difference). It appears that the criteria by which the alternatives are assessed are biased and implicitly favor the selection of the "preferred" alternative. In fact, the document is simply a statement of the proposed action (Alternative 1). In this case, we suggest that it would have been better to recognize upfront that due to the nature of the proposed action, certain aspects of the generic EE/CA documentation process cannot be logically applied. We believe that the needs to stabilize the site and allow for efficient performance of overall remedial actions are sufficient justifications for expedited dismantlement.

EPA-3 3. Four of the buildings to be addressed (No. 417, 433, 435, and 436) either show above background levels of external radiation, or lie close to other buildings or open areas that show such levels (see Figure 16, RI/FS Work Plan). It is not clear why it would not be appropriate to include these four

Response to EPA-2. The DOE agrees that there is sufficient justification for expediting dismantlement of the 15 Series buildings based on the need to stabilize the site and allow for efficient performance of overall remedial actions. The alternative of delaying the implementation of this action was included for completeness. Future EE/CAs of a similar nature will focus on the basic need for expediting the action (e.g., protect worker safety, improve environmental conditions, reduce or eliminate off-site releases, and stabilize portions of the site). Development and analysis of alternatives will not be emphasized in instances where it is not necessary to do so.

Response to EPA-3. All of the buildings addressed in the EE/CA are radioactively contaminated. An overview of the characterization activities conducted to date, and the results of the characterization activities for each building, are provided in the radiological and chemical characterization reports (MK-Ferguson Company and Jacobs Engineering Group 1990a, 1990b). These reports provide a good summary of the radioactive and chemical contamination associated with the buildings at the chemical plant.

The levels of radioactive contamination in Buildings 417, 433, 435, and 436 are generally low (although higher than the other 15 Series buildings); the levels in nearby soils are also low. The grouping of buildings for this evaluation was only partially based on contamination levels. Other parameters considered include physical location, estimated cost for dismantling, and building type.

EPA-3 buildings in subsequent cleanup activities, as they appear to be more logically grouped with more contaminated buildings. Specific contamination data regarding these buildings were not provided. Such data may indicate a clear difference in contamination levels between these four buildings and the buildings not included in this plan.

EPA-4 The following should be added to Table A.2:

Requirement	Citation
Radiation Protection Guidance to Federal Agencies for Occupational Exposure	52 FR 2822

Content	Relationship to Proposed Action
Provides recommended limits and methods of calculations for occupational exposure to radiation for federal agency workers	Augments previous guidance on occupational exposures

Sincerely yours,

Michael G. Sanderson
Chief, Superfund Branch
Waste Management Division

cc: David Bedan, MDNR

Response to EPA-4. Radiation protection requirements for occupationally exposed workers are provided in DOE Order 5480.11. The limits and methods for calculating occupational doses given in this Order are consistent with the cited guidance. In fact, this guidance is referenced in DOE Order 5480.11. Since all actions at the Weldon Spring site are conducted in compliance with DOE Orders, compliance with the requirements given in this guidance is implicit.

JOHN ASHCROFT
Governor

G. TRACY MEHAN III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation, and Historic Preservation

P.O. Box 176
Jefferson City, MO 65102

June 30, 1989

Mr. Rodney R. Nelson
Project Manager
U.S. Department of Energy
Weldon Spring Remedial
Action Project
Route 2, Highway 94 South
St. Charles, Missouri 63303

Dear Mr. Nelson:

The Missouri Department of Natural Resources (MDNR) has reviewed the Engineering Evaluation/Cost Analysis for the Proposed Management of 15 Nonprocess Buildings (15 series) at the Weldon Spring Site Chemical Plant, Weldon Spring, Missouri (DOE/OR/21548-071), May 1989. The MDNR agrees that the proposed action is needed.

However, the MDNR concurs with the comments made by the U.S. Environmental Protection Agency in the letter of June 16, 1989, to you from Mr. Michael Sanderson. I also reiterate the MDNR policy that all waste (including asbestos) from the Weldon Spring Site that
MDNR-1 is disposed of in a Missouri sanitary or demolition landfill must be considered to be a special waste. Therefore, such disposal would require approval from MDNR's Waste Management Program.

Sincerely yours,

DIVISION OF ENVIRONMENTAL QUALITY

David E. Bedan

David E. Bedan
Radioactive Waste Cleanup Coordinator

cc: Mr. Ron Kucera, MDNR
Mr. William Ford, MDNR
Mr. Nick Di Pasquale, MDNR
Mr. Randy Raymond, MDNR
Mr. Don Maddox, MDNR
Mr. Dan Wall, U.S. EPA, Region VII

DEB/cjj

Response to MDNR-1. A disposal facility for uncontaminated wastes resulting from this action has not yet been identified. However, the DOE will comply with this requirement if wastes are disposed of in a Missouri sanitary or demolition landfill.

REFERENCES

Argonne National Laboratory, 1990, *Feasibility Study for Management of the Bulk Wastes at the Weldon Spring Quarry, Weldon Spring, Missouri*, DOE/OR/21548-104, prepared by Environmental Assessment and Information Sciences Division, Argonne, Ill., for U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project, Weldon Spring, Mo., Feb.

MacDonell, M.M., and J.M. Peterson, 1989, *Engineering Evaluation/Cost Analysis for the Proposed Management of 15 Nonprocess Buildings (15 Series) at the Weldon Spring Site Chemical Plant, Weldon Spring, Missouri*, DOE/OR/21548-071, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project, Weldon Spring, Mo., May.

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1989, *Radiological Sampling and Measurement Results for the Non-Process Related Buildings and Equipment*, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project, Weldon Spring, Mo., May.

MK-Ferguson Company and Jacobs Engineering Group, 1990a, *Buildings Radiological Characterization Report*, DOE/OR/21548-120, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project, Weldon Spring, Mo., April.

MK-Ferguson Company and Jacobs Engineering Group, 1990b, *Asbestos and Chemical Characterization Report for Non-Process Related Buildings and Equipment*, DOE/OR/21548-070, Rev. E, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project, Weldon Spring, Mo., April.

DOE/OR/21548-071

ENGINEERING EVALUATION/COST ANALYSIS FOR THE PROPOSED MANAGEMENT OF 15 NONPROCESS BUILDINGS (15 SERIES) AT THE WELDON SPRING SITE CHEMICAL PLANT, WELDON SPRING, MISSOURI

by

Margaret M. MacDonell and John M. Peterson

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May 1989

work supported by

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Technical Services Division
Oak Ridge, Tennessee

DOE/OR/21548-071

ENGINEERING EVALUATION/COST ANALYSIS FOR THE PROPOSED MANAGEMENT OF 15 NONPROCESS BUILDINGS (15 SERIES) AT THE WELDON SPRING SITE CHEMICAL PLANT, WELDON SPRING, MISSOURI

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May 1989

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U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Technical Services Division
Oak Ridge, Tennessee

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TABLES

FOREWORD

The U.S. Department of Energy, under its Surplus Facilities Management Program (SFMP), is responsible for cleanup activities at the Weldon Spring site, located near Weldon Spring, Missouri. The site consists of two noncontiguous areas: (1) a raffinate pits and chemical plant area and (2) a quarry. This engineering evaluation/cost analysis (EE/CA) report has been prepared to support a proposed removal action to manage 15 nonprocess buildings, identified as the 15 Series buildings, at the chemical plant on the Weldon Spring site. These buildings have been nonoperational for more than 20 years, and the deterioration that has occurred during this time has resulted in a potential threat to site workers, the general public, and the environment.

The EE/CA documentation of this proposed action is consistent with guidance from the U.S. Environmental Protection Agency (EPA) that addresses removal actions at sites subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986. Actions at the Weldon Spring site are subject to CERCLA requirements because the site is on the EPA's National Priorities List.

The objectives of this report are to (1) identify alternatives for management of the nonprocess buildings; (2) document the selection of response activities that will mitigate the potential threat to workers, the public, and the environment associated with these buildings; and (3) address environmental impacts associated with the proposed action.

NOMENCLATURE

The following is a list of the acronyms, initialisms, and abbreviations (including units of measure) used in this document.

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FR	*Federal Register*
MSA	material staging area
no.	number
PCB	polychlorinated biphenyl
PL	Public Law
ROD	record of decision
SFMP	Surplus Facilities Management Program
Stat.	Statutes at Large
TBC	to-be-considered (requirement)
USC	United States Code
WL	working level

UNITS OF MEASURE

Ci	curie(s)
cm	centimeter(s)
cm^2	square centimeter(s)
cm^3	cubic centimeter(s)
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
g	gram(s)
gal	gallon(s)
h	hour(s)
ha	hectare(s)
in.	inch(es)
km	kilometer(s)
L	liter(s)
lb	pound(s)
µCi	microcurie(s)
µg	microgram(s)
µm	micron(s)
µR	microroentgen(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mi	mile(s)
mL	milliliter(s)
mrem	millirem(s)
pCi	picocurie(s)
ppm	part(s) per million
s	second(s)
yd^3	cubic yard(s)
yr	year(s)

1 SITE CHARACTERIZATION

1.1 SITE BACKGROUND

The Weldon Spring site is located in St. Charles County, Missouri, about 48 km (30 mi) west of St. Louis (Figure 1). It is surrounded by large tracts of land owned by the federal government and the state of Missouri. The site consists of two noncontiguous areas: (1) a raffinate pits and chemical plant area and (2) a quarry. The raffinate pits and chemical plant area are about 3.2 km (2 mi) southwest of the junction of Missouri (State) Route 94 and U.S. Route 40/61. The quarry is about 6.4 km (4 mi) south-southwest of the raffinate pits and chemical plant area and about 8 km (5 mi) southwest of the community of Weldon Spring in St. Charles County, Missouri. The raffinate pits and chemical plant area and the quarry are accessible from State Route 94. These areas are fenced and closed to the public.

The U.S. Department of the Army operated the Weldon Spring Ordnance Works at the site from 1941 to 1946 to produce trinitrotoluene and dinitrotoluene. In the mid 1950s, a portion of the property was transferred to the U.S. Atomic Energy Commission (AEC), a predecessor of the U.S. Department of Energy (DOE). From 1957 to 1966, the AEC operated a uranium processing facility at the Weldon Spring site. Uranium ore concentrates and some scrap uranium metal were processed at the chemical plant, and thorium-containing materials were also processed on an intermittent basis. Following closure by the AEC, the Army reacquired the chemical plant in 1967 and began converting the facilities to produce herbicides. Some buildings were partially decontaminated and some equipment was dismantled. In 1969, prior to becoming operational, the herbicide project was canceled. Since that time, the plant has remained essentially unused and in caretaker status. The Army returned a portion of the chemical plant property to the AEC in 1971 but retained control of the buildings. In 1984, the Army repaired several of these buildings; decontaminated some of the floors, walls, and ceilings; and removed some contaminated equipment to other areas (e.g., onto the ground outside of the process buildings as well as into certain nonprocess buildings). In 1985, custody of the chemical plant property was transferred to DOE.

The chemical plant consists of 44 buildings and miscellaneous structures (Figure 2). Some of these facilities were part of the Weldon Spring Ordnance Works, but most were built during 1955-1958 for the AEC operations. The majority were support buildings for the chemical plant; a few were initially erected to support plant construction activities and were used as warehouses and supply buildings after the plant was completed. The actual processing of radioactive material occurred in only a limited number of chemical plant buildings. Of the 44 buildings, 39 were nonprocess buildings (8 of which were general support buildings), and 5 were major process buildings (MK-Ferguson and Jacobs Engineering 1989a).

1.2 DESCRIPTION OF THE 15 SERIES BUILDINGS

Fifteen nonprocess buildings comprise the 15 Series buildings that are addressed in this proposed action: Buildings 104, 302, 412, 413, 415, 417, 428, 433, 435, 436, 437,

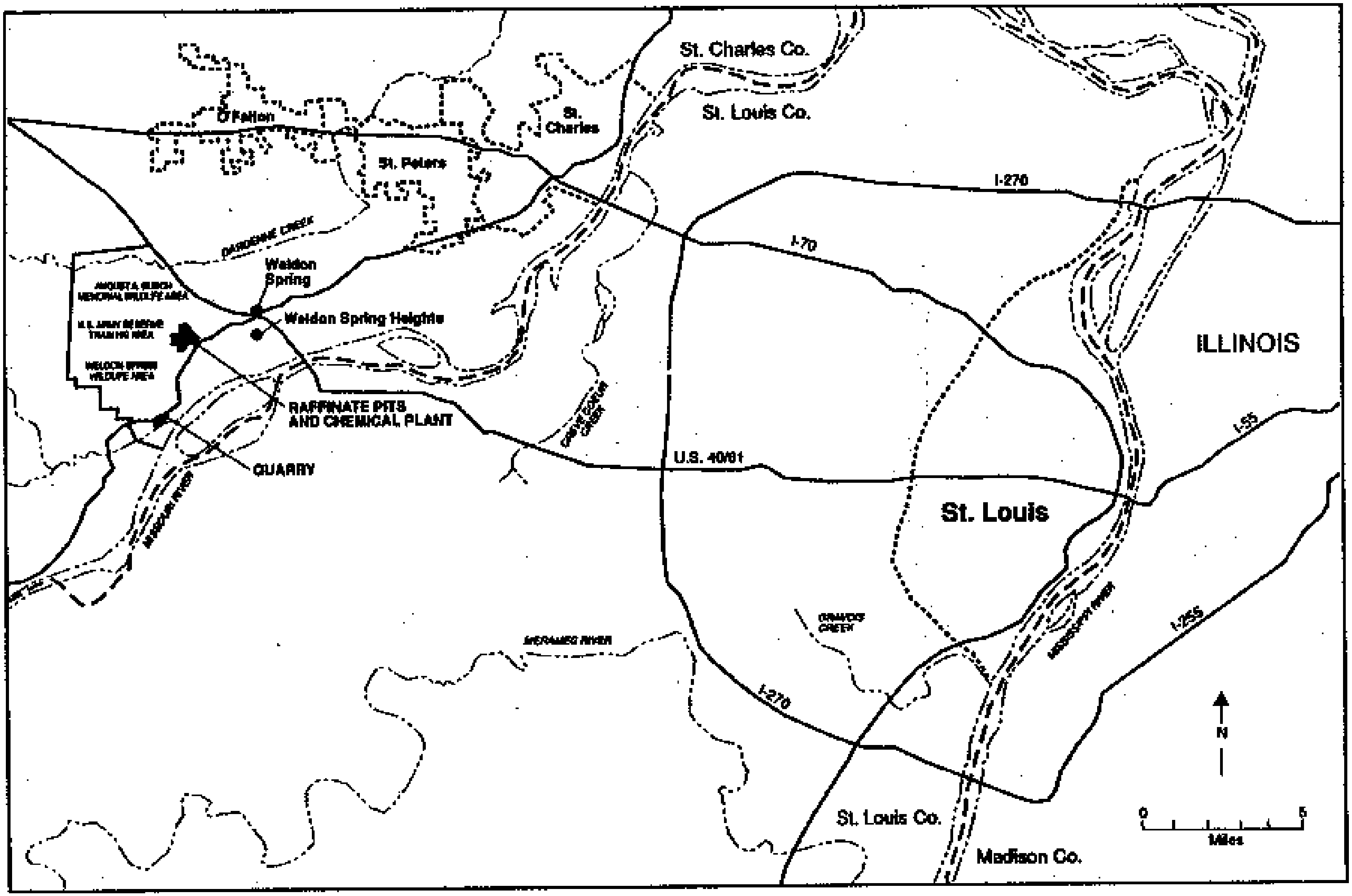

FIGURE 1 Area and Vicinity Map of the Weldon Spring Site, Weldon Spring, Missouri

438, 439, 441, and 443. The locations of these buildings are shown in Figure 2, and a general description is presented in Table 1. Although none of the buildings was used for the direct processing of radioactive material, some may have become radioactively contaminated during the operational period of the chemical plant or subsequent to plant closure. During the operational period, contamination may have occurred as a result of (1) routine plant operations (e.g., tracking of contaminants from process areas and temporary relocation of contaminated equipment for repair), (2) processing support activities (e.g., waste handling), and (3) surficial deposition of airborne particulates. Following plant closure, contamination may have occurred as a result of (1) relocation of some contaminated equipment from process buildings into nonprocess buildings during prior cleanup activities and (2) transport of contaminated material by environmental factors (e.g., wind) and local biota (e.g., wasps that built nests with contaminated mud).

The 15 Series buildings were recently characterized in detail in order to inventory the equipment present and to determine the nature and extent of radiological and chemical contamination. The methods and results of this characterization effort are presented in the sampling plan and in the radiological and chemical characterization reports (MK-Ferguson and Jacobs Engineering 1988c, 1989a, 1989b). A brief summary of the results is presented in Table 2. Additional radiological and chemical characterization would be conducted prior to and during building dismantlement, as required, to ensure worker safety and to support waste classification and decontamination activities.

1.3 SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION

Since their closure more than 20 years ago, the chemical plant buildings have deteriorated considerably. Many of the windows are broken, some walls have separated from the floors, floors have begun to break apart, and roofs have deteriorated to the extent that they leak badly during rainstorms. Polychlorinated biphenyl (PCB) contamination of floors and limited radiological contamination of various surfaces (e.g., associated with relocated equipment, interior dust, and roofing material) currently represent potential exposure hazards to on-site personnel and, as building deterioration continues, could threaten the general public and the environment off-site, e.g., via tracking, surface water runoff, or wind dispersion. In addition, the protective coverings for asbestos-containing insulation material in the buildings could continue to deteriorate, thereby increasing the potential for asbestos release and exposure.

The potential for health and safety threats on-site and for contaminant releases off-site would increase over time if deterioration of the 15 Series buildings remained unchecked. Expedited dismantlement of the buildings, i.e., prior to the record of decision (ROD) for comprehensive site remediation, would reduce associated occupational hazards on-site as well as potential threats to public health and the environment from off-site releases of chemical and radioactive contaminants.

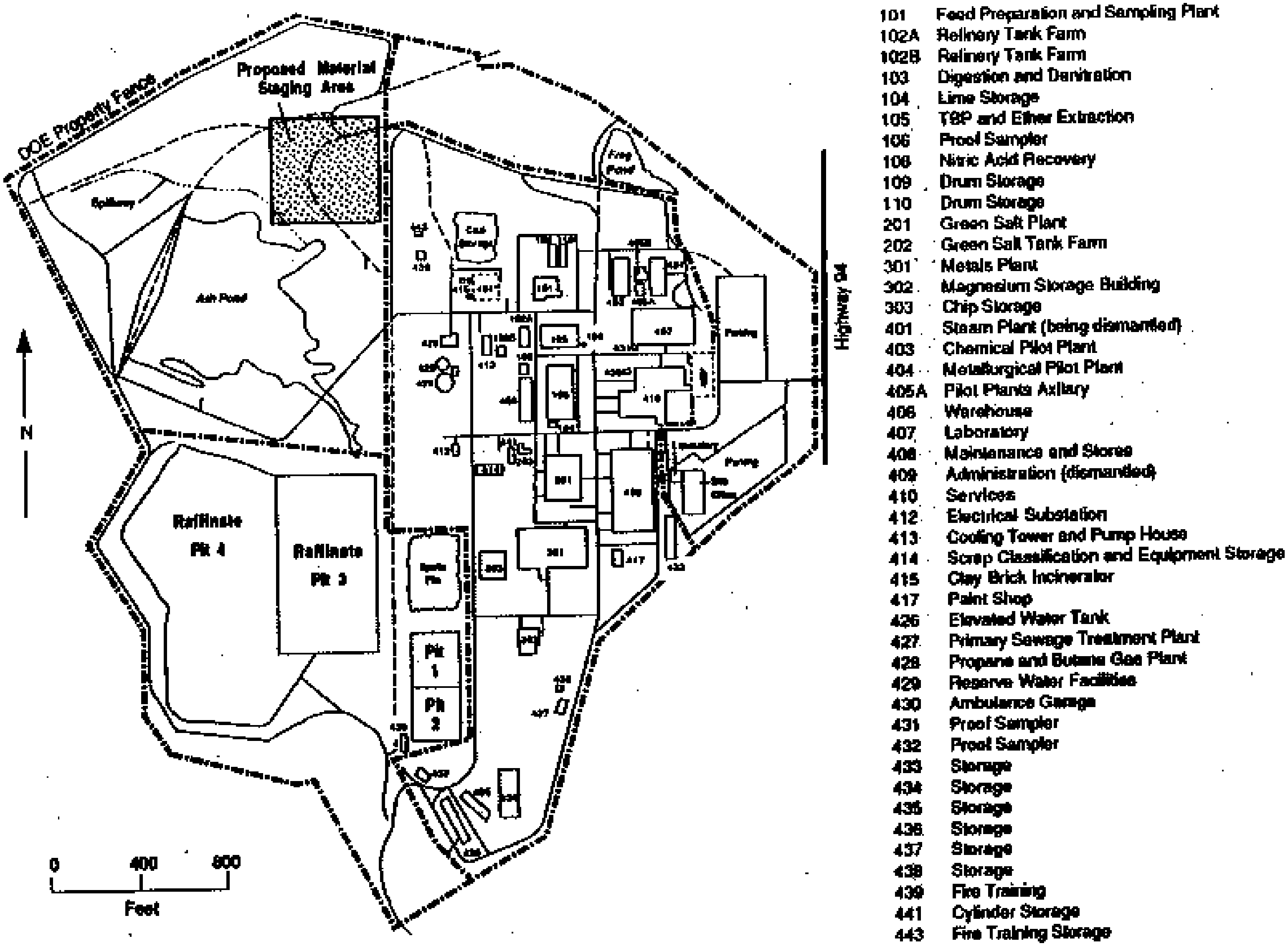

FIGURE 2 Layout of the Weldon Spring Raffinate Pits and Chemical Plant Area (Source: Modified from MK-Ferguson and Jacobs Engineering 1988b, 1988c)

TABLE 1 General Description of the 15 Series Buildings

Building	Structure[a]	Past Use	Equipment Content
104	29-ft × 18-ft × 13-ft metal base with concrete floor; 10-ft diameter, 20-ft steel hopper; upper 10-ft × 10-ft × 12-ft prefabricated steel shed	Store and distribute lime as slurry for raffinate neutralization	Pump, motor, metal bin, and electrical/mechanical instruments
302	One-story structure with a 22-ft × 48-ft × 30-ft process area; 4,800-ft^2 × 10-ft warehouse; 12-ft × 12-ft × 12-ft battery charging area; and 36-ft^2 × 12-ft restroom; concrete floor, concrete block construction with steel frame and flat, built-up roof	Pelletize and store drums that contained magnesium chips and process and repackage the magnesium	Process hopper, magnetic separator beams and columns, sampler drums, carbon plates, iron cartridges, cabinets, lighting and heating equipment (e.g., water heater and steam pipes), and restroom fixtures
412	49-ft × 22-ft × 13-ft structure with concrete floor, concrete block construction with steel frame and built-up roof on poured concrete deck; contains small office and meter room	Electric substation to transform incoming power for distribution to secondary substations at the plant	Valves, pumps, motors, wooden boxes, and a fire hose

TABLE 1 (Cont'd)

Building	Structure[a]	Past Use	Equipment Content
413	30-ft × 90-ft × 22-ft redwood cooling tower; 92-ft × 32-ft × 6-ft concrete collection basin, with 7-ft × 100-ft and 47-ft × 8-ft flumes on the north and west sides, and an adjacent 29-ft × 50-ft × 24-ft steel frame building with corrugated asbestos siding and concrete floor	Recirculate cooling water and house pumping/chemical treatment facilities	Water treatment equipment, steam heaters, gauges, valves, pumps, motors, an exhaust fan, and a fire hose
415	6-ft × 10-ft × 7-ft brick incinerator supported by a steel frame	Incinerate process wastes	None
417	2,772-ft^2 (gross area), one-story steel frame and concrete block structure with concrete floor and flat, poured gypsum concrete roof deck; three sections: general work area, spray painting booth, and flammable material storage area	Maintain and store equipment, conduct spray-painting operations, and store flammable material and paint cans	Cabinets, lockers, work benches, tables, chairs, barrel stands, steam heaters, and a fire hose
428	12-ft × 15-ft × 15-ft structure with corrugated transite siding	Supply fuel gas (propane-air mixture) to various buildings for process heat	Electric pumps, compressors, and condensors

TABLE 1 (Cont'd)

Building	Structure[a]	Past Use	Equipment Content
433	40-ft × 182-ft × 24-ft, one-story steel beam frame with prefabricated sheet metal panels and a concrete slab floor; attached 13-ft × 14-ft × 11-ft concrete structure	Store maintenance vehicles and smaller mechanical equipment	Tractors, forklifts, trucks, automotive parts, scaffolding, bricks, barrels, scales, work benches, shelves, hardware and plumbing supplies, hoses, buckets, tools, and small machine parts
435	162-ft × 40-ft × 20-ft Butler building with prefabricated sheet metal panels and concrete floor	Store water-treatment chemicals and miscellaneous mechanical parts	Cabinets, work benches, tables, shelves, pallets, space heater, fume hoods, ovens, map stand, and various pieces of furniture and electrical, sampling and safety equipment
436	200-ft × 40-ft × 23-ft Butler building with steel frame and prefabricated panels and concrete floor; small restroom and enclosed office at south end	Store general items	Freezers, motors and machine parts, lab fixtures, pipe fittings, crates of cast metal, bins of firebrick, ladders, and various pieces of furniture
437	2,200-ft^2 (gross area), one-story brick structure with concrete foundation and floor and flat, built-up roof; seven rooms	Store documents (originally an ordnance works building)	Furnace, file cabinets, boxes of rock core, broken furniture, and other debris

TABLE 1 (Cont'd)

Building	Structure[a]	Past Use	Equipment Content
438	4,000-ft^2 × 16-ft structure, with 300-ft^2 × 10-ft office, steel beam frame construction with prefabricated steel panels and concrete foundation and floor	Store general items (originally a construction-support building)	Process hoppers, electrical equipment, boxed insulation, file cabinets, office furniture, and scale models of chemical plant buildings
439	600-ft^2 × 15-ft steel beam frame structure with metal panels and a concrete floor	Train employees in safety and fire protection (classroom setting)	Various debris, including charred wood and tires
441	1,200-ft^2 × 20-ft structure with steel support columns, corrugated aluminum panels, concrete floor, and 15-ft × 65-ft ramp to the loading dock	Store cylinders of compressed gas prior to their transport off-site	Fencing and steel/cinder-block cylinder racks
443	200-ft^2 × 8-ft, one-story wooden shed with shingled roof and wooden floor on a concrete slab	Store fire-protection equipment	Wood-burning stove and three desks

[a]See Appendix C for English/metric conversion factors.

TABLE 2 Summary of the Chemical and Radiological Characterization Results for the 15 Series Buildings[a]

	PCB Contamination[b]						Asbestos Contamination		Radiological Contamination	
	Swipe Samples		Bulk Samples							
Building	Sample	Conc. (μg/100 cm^2)	Sample	Conc. (ppm)	Suspect Light Fixtures (no.)	Volume (ft^3)	Pipe Insulation Volume (ft^3)	Transite Panels Volume (ft^3)	Number of Measurements	Volume (yd^3)
104	1-4	<3	0	–	0	0	35	0	453	15
302	1	133	0	–	0	6	35	15	1,643	200
	2-8	<1								
412	1	3	0	–	0	3	0	5	607	20
	2	10								
	3	12								
	4	16								
	5	17								
	6	24								
413	1	5	0	–	0	5	45	175	909	140
	2	7								
	3	26								
	4	118								
	5[c]	TBD								
415	0	–	1[c]	TBD	0	TBD	0	0	125	2
417	1-3	<1	1	218	0	9	70	0	556	16
	4	66	2	295						
	5	131								
	6	189								
	7	221								
	8	261								

TABLE 2 (Cont'd)

	PCB Contamination[b]						Asbestos Contamination		Radiological Contamination	
	Swipe Samples		Bulk Samples							
Building	Sample	Conc. (µg/100 cm^2)	Sample	Conc. (ppm)	Suspect Light Fixtures (no.)	Volume (ft^3)	Pipe Insulation Volume (ft^3)	Transite Panels Volume (ft^3)	Number of Measurements	Volume (yd^3)
428	1	2	0	-	3	0	15	55	607	10
	2-3	4								
	4	5								
433	1-8	<1	1	<5	104	0	70	0	926	500
			2	6						
			3	24						
			4	30						
435	1-4	<1	0	-	3	6	0	35	618	140
	5	2								
	6	3								
	7	28								
	8	31								
436	1-5	<1	1	<5	5	0	0	0	867	170
	6	1								
	7	2								
437	1-7	<1	0	-	47	0	0	15	447	90
	8[d]	-								

TABLE 2 (Cont'd)

	PCB Contamination[b]						Asbestos Contamination		Radiological Contamination	
	Swipe Samples		Bulk Samples							
Building	Sample	Conc. (μg/100 cm^2)	Sample	Conc. (ppm)	Suspect Light Fixtures (no.)	Volume (ft^3)	Pipe Insulation Volume (ft^3)	Transite Panels Volume (ft^3)	Number of Measurements	Volume (yd^3)
438	1-4	1	0	-	0	0	0	0	603	70
	5	2								
	6-7	3								
	8	4								
439	1-2	<1	1	1307	0	15	0	0	548	10
441	1-2[c]	TBD	0	-	0	TBD	TBD	TBD	627	30
443	0	-	1	<1	0	TBD	0	0	121	7
			2[d]	-						
			3[c]	TBD						

[a]A hyphen indicates that no data exist; TBD means "to be determined" (i.e., when analysis is completed); all volumes are estimated. See Appendix C for English/metric conversion factors.

[b]Samples were taken both in areas of visible oily spills and in areas where no suspect residue was visible; all fluorescent light fixtures are considered suspect, based on potential PCB contamination of the ballasts.

[c]Additional sample(s) scheduled for analysis.

[d]One sample lost during analysis.

[e]Building contains six boxes (about 100 ft^3) of asbestos insulation material.

2 REMOVAL ACTION OBJECTIVES

The objectives of the proposed management of the 15 Series buildings are to mitigate the potential for releases of chemical and radioactive contaminants from these buildings and to minimize associated threats to workers, the general public, and the environment. The overall objectives of this action are defined in Sections 2.1 through 2.4 in terms of statutory limits, scope and purpose, schedule, and compliance with regulatory requirements.

2.1 STATUTORY LIMITS

The authority for responding to releases or threats of releases from a hazardous waste site is addressed in Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Executive Order 12580 delegates to DOE the response authority for DOE sites. The statutory limits of Superfund-financed removal actions are 1 year and $2 million, as specified in Section 104(e)(1) of the Superfund Amendments and Reauthorization Act. These limits do not apply to removal actions authorized under CERCLA Section 104(b) that are not financed by the U.S. Environmental Protection Agency (EPA) with Superfund monies. Therefore, they do not apply to the proposed action because the Weldon Spring Site Remedial Action Project is being funded by the DOE, with pro rata support from the Army. However, these statutory limits for EPA-financed actions are considered general guidelines for planning purposes.

2.2 SCOPE AND PURPOSE

The scope of the proposed removal action can be broadly defined as management of 15 nonprocess buildings at the chemical plant on the Weldon Spring site. The primary purpose of the action is to limit the potential for contaminant releases into the environment from these buildings. The specific objectives of this action are to:

- Reduce the potential health and environmental hazards of radiation exposure associated with uranium and thorium contamination of roofing material, building surfaces, and equipment;

- Reduce the potential health and environmental hazards of PCB exposure associated with contaminated floors and of asbestos exposure associated with siding material, pipe insulation, and equipment;

- Minimize the potential health hazards to on-site personnel due to deterioration of the 15 Series buildings; and

- Facilitate subsequent response activities at the Weldon Spring site.

2.3 SCHEDULE

The proposed management of the 15 Series buildings is scheduled to begin by fiscal year 1990 (October 1, 1989) and to be completed within 1 year, pending the availability of funds. The primary scheduling objective is to complete the action within a limited period in order to support the project's overall decision-making process and to permit the timely implementation of subsequent response actions.

2.4 COMPLIANCE WITH REGULATORY REQUIREMENTS

The proposed removal action would be carried out in accordance with all applicable or relevant and appropriate requirements (ARARs). In addition to ARARs, "to-be-considered (TBC)" requirements may play a role in the selection and implementation of a preferred alternative. These TBC requirements, e.g., standards identified in specific departmental orders, are not promulgated by law but may be significant for the proposed action.

The potential requirements for the proposed action can be divided into two major groups. The first group contains those laws and orders that are generically applicable to the authorization, objectives, planning, or implementation of policies or actions related to environmental response (e.g., the Atomic Energy Act and a number of federal orders). Because many of the components of this group have led to the establishment of standard policies and procedures for undertaking response actions, they are not discussed in detail in this report. The proposed action would fully comply with these laws and orders. The second group contains those laws and orders that may have specific applicability to the management of the 15 Series buildings (e.g., CERCLA and the Occupational Safety and Health Act). The proposed action would be conducted in accordance with all applicable or relevant and appropriate requirements of this second group, which are summarized in Appendix A.

3 REMOVAL ACTION TECHNOLOGIES

Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan and EPA's guidance on removal actions, alternatives for the proposed action were developed pursuant to a consideration of source-control and migration-control technologies. In addition, these alternatives were limited to those that can be performed under CERCLA and remain within the constraints of the Council on Environmental Quality's regulations for the National Environmental Policy Act, i.e., the actions must not have an adverse environmental impact nor limit the choice of reasonable alternatives for overall site remediation [40 CFR 1506.1(a)].

3.1 SOURCE-CONTROL AND MIGRATION-CONTROL TECHNOLOGIES

The objective of source-control technologies is to protect public health and the environment by altering the nature of a waste source (i.e., its radioactively or chemically hazardous constituents) to reduce its toxicity, mobility, and/or volume. Migration-control technologies are designed to mitigate potential exposure to contaminants that have migrated from a source and to limit human activity that could result in such migration.

Examples of source-control technologies that may be applicable to the proposed removal action are (1) access restrictions (fences and signs); (2) removal (dismantling buildings); (3) treatment (of PCB-contaminated flooring with a solvent wash); (4) temporary storage (of radioactively contaminated material in a controlled area on-site); and (5) disposal (of asbestos-containing material in a licensed facility off-site). Examples of migration-control technologies that may be applicable to the proposed removal action include (1) access restrictions (fences and signs) and (2) containment/treatment, either in-situ or following removal (by wrapping asbestos-containing material in place or by removing it from the affected structure or equipment for subsequent isolation, with treatment as appropriate). Each of these categories may contain various control technologies that are applicable to specific aspects of the proposed action.

3.2 IDENTIFICATION OF PRELIMINARY ALTERNATIVES

Based on a consideration of applicable technologies, two options were identified as general alternatives for management of the 15 Series buildings:

- Alternative 1: Expedite dismantlement of the buildings, implementing specific source- and migration-control technologies; decontaminate surfaces to the extent possible; reclaim reusable material for salvage, as appropriate; transport all nonradioactively contaminated material, i.e., all nonsalvageable material that meets the criteria for release without radiological restrictions (see Appendix B), to approved treatment/disposal facilities off-site; and place all

radioactively contaminated material in controlled temporary storage on-site, pending a decision on the ultimate disposition of the Weldon Spring site.

- **Alternative 2: Delay action until the ROD for the project is issued.**

4 EVALUATION OF ALTERNATIVES

The two alternatives for the proposed action identified in Section 3 were evaluated according to three broad criteria (see Sections 4.1 through 4.3):

- Effectiveness, in terms of ensuring protection of and minimizing impacts to the public and the environment;
- Implementability, in terms of
  - Time required for implementation (i.e., timeliness);
  - Technical feasibility (technology-specific and site-specific factors and applicability to project goals); and
  - Responsiveness to institutional considerations such as EPA, state, and community acceptance and compliance with specific project requirements (e.g., budget, schedule, and efficient performance of the overall remedial action planned for the site); and
- Reasonable cost, in terms of capital costs and operation and maintenance costs (both short-term and long-term).

4.1 EFFECTIVENESS

Expedited dismantlement of the buildings under Alternative 1 would ensure protection of workers, the public, and the environment from building-associated threats in the near term whereas delayed action under Alternative 2 would not. Alternative 2 affords no reduction in the potential health threat posed by radioactive material and PCB- and asbestos-contaminated material associated with the 15 Series buildings. Environmental conditions at the site would not be improved during the near term under Alternative 2 because of the delay in initiating cleanup. In addition, worker health and safety hazards could be worsened and contaminants could spread uncontrolled into the local environment during the delay period as a result of continued building deterioration. Potential health and environmental impacts of implementing either alternative are addressed in Sections 4.1.1 and 4.1.2, respectively.

4.1.1 Potential Health Impacts

Under Alternative 1, the potential radiation doses to workers conducting the building dismantlement would be kept as low as reasonably achievable by standard health-physics practices and by strict compliance with environmental protection, safety, and health protection guidelines (see Appendix A). The amount of radioactive contamination associated with the 15 Series buildings is low, and uranium is the principal radioactive contaminant (MK-Ferguson and Jacobs Engineering 1989a). The measured gamma exposure rates at 1 m (3 ft) from building surfaces are indistinguishable from instrument background levels; therefore, no external radiation hazard would exist for workers during the decontamination and dismantling of these buildings.

Similarly, no external radiation hazard would exist for workers during the temporary storage of contaminated building debris. Following building dismantlement, all radioactively contaminated material would be placed in controlled storage on-site, pending a comprehensive decision for final disposition. The total volume of radioactively contaminated material that would result from dismantlement is estimated to be 1,800 m^3 (2,400 yd^3), and the total amount of radioactivity in this material (as uranium-238) is estimated to be about 0.15 Ci. Assuming a density of 1.6 g/cm^3, the average concentration of radioactivity in the stored material is estimated to be 50 pCi/g. The exposure rate associated with this material is estimated to be about 1 μR/h, which is insignificant relative to the exposure rate of about 10 μR/h resulting from background radiation in the local environment. The level of radiation associated with the stored wastes would decrease rapidly over a relatively short distance, such that it would be indistinguishable from background radiation within about 10 m (30 ft) of the storage area.

Based on the low levels of external radiation currently associated with the buildings and those estimated for the storage location, the only pathway by which workers could incur radiation doses in excess of background exposure would be inhalation of airborne radioactive contaminants generated during decontamination, dismantlement, or temporary storage activities. The potential inhalation doses to workers would be kept low by using procedures to minimize the amount of airborne contamination, such as wetting surfaces to reduce dust generation and requiring workers to wear respiratory protection equipment, as necessary, to reduce the likelihood of inhaling contaminated particulates. In addition, air monitoring would be conducted in the work place to assess air quality so that a safe environment could be ensured.

The incremental radiation doses to the general public from implementing Alternative 1 would be immeasurably small relative to the doses received from background sources of radiation. Appropriate health-physics practices would be used to minimize airborne releases of radioactivity during decontamination, dismantlement, and temporary storage activities, thereby ensuring that the general public would not be exposed to any measurable amount of radioactivity.

Similarly, potential nonradiological impacts of Alternative 1 would be minimal. Appropriate worker protection equipment and procedures would be employed to minimize releases of asbestos and PCBs in the workplace, thereby ensuring that neither the workers nor the general public would be exposed to any measurable amounts of these contaminants.

Material that contained only chemical contaminants (e.g., asbestos or PCBs) would be transported off-site to a treatment/disposal facility. The total volume of asbestos-containing material that would result from the proposed action is estimated to be 16 m^3 (21 yd^3), consisting primarily of pipe insulation and transite siding. The total volume of PCB-contaminated material that would result from the proposed action is estimated to be 1.2 m^3 (1.6 yd^3), consisting primarily of solvents and wipes.

In general, the potential impacts of Alternative 2 would be similar to those of Alternative 1, but their initiation would be delayed. However, further deterioration of the 15 Series buildings would occur during the delay, which would increase the potential for adverse impacts to site workers during the eventual implementation of building decontamination and dismantlement. In addition, incremental adverse impacts to the public could occur under Alternative 2 because radioactive and chemical contaminants would continue to be released from the buildings into the local environment during the delay period.

4.1.2 Potential Environmental Impacts

Soil Resources. Alternative 1 would involve the short-term disturbance of small areas of soil in the building dismantlement and temporary storage locations. An estimated 0.4 ha [1.0 acre]), including laydown areas, would be affected by dismantling the 15 nonprocess buildings; about 1.2 ha (3 acres) would be affected by preparing an area for the temporary storage of contaminated material associated with building dismantlement (MK-Ferguson and Jacobs Engineering 1988b). Because these areas were previously disturbed during construction and operation activities at the chemical plant, no long-term adverse impacts to either natural soils or archeological resources are expected (Weichman 1986). Some areas of soil adjacent to certain buildings (e.g., Buildings 433, 435, and 436) contain radioactive contaminants due to prior plant activities. These areas could be excavated concurrently with building dismantlement if it were determined that tracking or other dispersal of soil contaminants could be caused by the dismantlement activities. In accordance with the plan for all such material at the Weldon Spring site, the excavated soil would be controlled and stored on-site pending the comprehensive disposal decision.

In general, the potential impacts of Alternative 2 on soil resources would be similar to those of Alternative 1, but their initiation would be delayed. However, under Alternative 2, contaminants released from the deteriorating buildings during the delay period could result in an incremental contamination of area soils.

Water Resources. Implementation of Alternative 1 is not expected to adversely impact local water resources in the long term. During the short term, dismantlement activities could result in temporary increases of suspended solids concentrations in nearby surface waters (e.g., via the southeast drainage) from surface runoff during storms. To minimize the potential for such impact, good engineering practices and mitigative measures would be implemented to control erosion (e.g., emplacing straw bales or sediment barriers), as appropriate. Similarly, potential adverse impacts associated with the temporary storage area would be minimized by constructing the storage area with runon/runoff controls and covering it, as appropriate (see Chapter 5).

In general, the potential impacts of Alternative 2 on water resources would be similar to those of Alternative 1, but their initiation would be delayed. However, under Alternative 2, contaminants could continue to migrate off-site via surface water and/or groundwater during the delay period. Such migration would contribute to an incremental contamination of local water resources.

Air Quality. Dust released during the dismantlement or temporary storage activities of Alternative 1 could impact local air quality during the short term. The potential for dust generation would be minimized by limiting vehicular traffic and by implementing good engineering practices such as wetting and/or covering exposed surfaces, as appropriate, during the action period. Monitors would be installed to determine particulate concentrations so that compliance with regulatory requirements and protection of worker health and safety would be ensured.

In general, the potential impacts of Alternative 2 on air quality would be similar to those of Alternative 1, but their initiation would be delayed. However, under Alternative 2, an incremental impact on air quality could occur during the delay period as a result of airborne contaminants (e.g., asbestos) being released off-site due to further deterioration of the 15 Series buildings.

Vegetation and Wildlife. Adverse impacts to vegetation and wildlife related to noise, visual disturbance, or dust resulting from Alternative 1 would be minimal. The affected area is primarily composed of buildings and does not provide unique wildlife habitat, nor are plant species in the area restricted in distribution. Further, the total affected area (about 1.6 ha [4 acres]) is negligible relative to the undeveloped portions of the adjacent Army Reserve property and the thousands of acres of nearby wildlife areas (see Figure 1). Animals and vegetation are not likely to receive any significant exposure to airborne contaminants during the action period because such releases would be controlled. Finally, no impacts to threatened or endangered species are anticipated because the chemical plant does not provide any critical habitat for such species, and those that may occupy the site (e.g., the bald eagle) do so only intermittently.

In general, the potential impacts of Alternative 2 would be similar to those of Alternative 1. However, under Alternative 2, contaminants released from the buildings during the delay period could be taken up by local biota, and animal tracking could result in the spread of current contamination, thereby increasing the potential for incremental adverse impacts.

4.2 IMPLEMENTABILITY

Alternative 1 is both timely and technically feasible. Standard procedures and equipment would be used to conduct the expedited dismantlement of the 15 Series buildings under this alternative. In contrast, Alternative 2 is not timely because it would delay the implementation of necessary response activities for these buildings. Technical feasibility considerations do not apply to Alternative 2 in the near term but, after the delay period, would be similar to those for Alternative 1.

4.3 COST

The cost of implementing Alternative 1 is estimated to be $900,000. Although Alternative 2 would cost nothing in the short term, the buildings are scheduled for eventual demolition. Thus, the costs associated with delayed action would be higher than those for expedited dismantlement, due to inflation as well as the potential for increased costs to (1) maintain the buildings until their eventual dismantlement, (2) repair structural deficiencies if they posed an imminent danger during the course of the delay, and (3) conduct an expanded cleanup if contaminants were released into the environment during the delay.

4.4 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

Based on the evaluation of alternatives for the proposed management of the 15 Series nonprocess buildings at the chemical plant, Alternative 1 — expedited dismantlement -- has been identified as the preferred alternative. Alternative 1 can be implemented in a straightforward manner, it is cost-effective, and it would reduce adverse impacts to worker safety and would minimize the potential risk to public health and the environment associated with these buildings. Finally, Alternative 1 is consistent with and would contribute to the efficient performance of overall remedial actions being planned for the Weldon Spring site.

5 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to dismantle 15 nonprocess buildings and to salvage or transport off-site for treatment/disposal all nonradioactively contaminated material. This action would include the following activities:

- Manual decontamination of all radioactively contaminated surfaces (e.g., by aggressively vacuuming/wiping equipment exteriors and building interiors/exteriors), with containment and storage on-site of all radioactively contaminated material;

- Removal of all PCB-contaminated material (e.g., using a solvent wipe procedure), with transport off-site of all nonradioactively contaminated material to an approved treatment/disposal facility and containment and storage on-site of any radioactively contaminated material (i.e., the material would be drummed and stored with the site's containerized chemicals, which are currently stored in Building 406);

- Isolation of all asbestos-containing material (e.g., in plastic bags) pending transport off-site of all nonradioactively contaminated material to an approved landfill, with containment and storage on-site of any radioactively contaminated material;

- Follow-on decontamination of structural surfaces, as appropriate, to remove radioactive contamination;

- Dismantlement of all structures, with further decontamination of previously inaccessible surfaces during dismantlement;

- Placement of all radioactively contaminated material in a controlled area for temporary storage; and

- Salvage or transport off-site of all nonradioactively contaminated material for treatment/disposal at an approved facility, as appropriate.

The proposed activities are similar to those currently under way at the Weldon Spring site for the dismantlement of the steam plant and administration buildings (Buildings 401 and 409, respectively). These ongoing dismantlements are being conducted in accordance with all applicable or relevant and appropriate requirements and procedures. Likewise, the 15 Series buildings would be dismantled in accordance with all such requirements and procedures. Dust-control measures, such as wetting and covering surfaces, would be employed to minimize particulate emissions during all activities associated with dismantlement. Air in the work area would be monitored for asbestos and radioactive particulates as part of a comprehensive detection and mitigation system. Asbestos- and PCB-handling and disposal activities would comply with safe practices and regulatory requirements (see Appendix A). This compliance would ensure the protection of workers on-site and would limit the potential for contaminant releases off-site. In addition, the proposed dismantlement would preclude the associated adverse impacts on public health and the environment that could result from further building deterioration.

The 15 Series buildings would be dismantled following cleanup of the removable contamination from building surfaces. All activities and results associated with the radiological characterization, decontamination, and dismantlement of the buildings would be subjected to independent verification. In addition to reviewing sampling procedures and results, the independent verification contractor (Oak Ridge Associated Universities) would visit the site both during and after the dismantling effort to ensure that all activities were conducted in a safe and effective manner.

At-grade or below-grade material that remained following building dismantlement would be decontaminated and/or excavated. In general, the floors of the buildings that are radioactively contaminated contain (1) loose dust deposits, which could be removed by aggressive vacuuming and/or (2) limited, fixed contamination, which could be removed by scarifying (measured radioactivity is at background levels within 2 cm [1 in.] of the surface [MK-Ferguson and Jacobs Engineering 1989a]). Material that remained for the near term would be surface-sealed or otherwise protected to limit the potential for any contaminant release to, or exposure to contaminants from, the local environment. Material that did not meet the criteria for release without radiological restrictions would be placed in temporary storage on-site. The planned management of all other material is consistent with the volume-reduction mandate of CERCLA because the salvage or off-site treatment/disposal of nonradioactive material (as appropriate) would limit the amount of on-site material requiring a disposal decision.

A temporary storage area, also referred to as the material staging area (MSA), would be used to store all solid materials containing radioactive contamination, pending a decision on their ultimate disposition. The MSA would be constructed with two contiguous sections -- one for material that did not constitute a source for potential contaminant release and a second for material that might constitute such a source. Construction of each section would include an underlying impermeable clay liner, a runon/runoff control system, and a cover (e.g., geotextile fabric or emulsion) to protect the stored material from wind and water dispersal, as required. The performance and conceptual design requirements for the MSA are discussed in detail in a separate report (MK-Ferguson and Jacobs Engineering 1988b).

The proposed location of the MSA is shown in Figure 2. The soils of this area have been studied extensively to characterize the contamination, if any. The Phase I chemical soil investigation program was recently completed at the Weldon Spring site (MK-Ferguson and Jacobs Engineering 1988a); the results indicate that only nitrate and sulfate levels are slightly elevated and that no chemical hazards exist in the area proposed for the MSA. A focused soil characterization was subsequently conducted at this location. Under this follow-on study, soil samples were analyzed for metals, inorganic anions (nitrate, sulfate, chloride, and fluoride), and nitroaromatics; select samples were also analyzed for pesticides, PCBs, and semivolatile organic compounds. The results of these analyses indicate that metal and inorganic anion concentrations are within the range of on-site background concentrations and that only limited organic contaminants are present, including phthalates and the pesticide aldrin. No soil contamination was detected that would impact the performance of the MSA (MK-Ferguson and Jacobs Engineering 1988d).

A comprehensive radiological characterization of the site was also recently completed (Marutzky et al. 1988). The results indicate that radium-226 and thorium-232 are generally present in concentrations typical of background levels; measurements ranged from less than 1 to 2 pCi/g, including background. Thus, no radioactive contamination exists above guidelines for thorium and radium in soil (see Appendix B). Measured concentrations of total uranium — for which no such guidelines exist — were similarly low, ranging from less than 0.3 to 6.3 pCi/g, including background. The average ambient concentration of total uranium that occurs naturally in soil is about 2 pCi/g. Therefore, no adverse impacts are expected during construction of the MSA (MK-Ferguson and Jacobs Engineering 1988b). Air monitoring for radioactive particulates would be conducted in the MSA workplace during the construction period. If elevated levels were detected, mitigative measures would be implemented (e.g., wetting and covering surfaces) to ensure the health and safety of workers, the public, and the environment.

In conclusion, it is proposed that dismantlement of the 15 nonprocess buildings be expedited in order to (1) improve near-term environmental and safety conditions on-site and (2) ensure the long-term protection of public health and the environment by precluding the potential for releases of asbestos, PCBs, and radioactive dusts that could result from continued building deterioration. Implementation of the proposed action at this time is consistent with and would support the overall objectives of remedial actions being planned for the Weldon Spring site.

6 REFERENCES

Marutzky, S.F., R. Colby, and L.S. Cahn, 1988, *Radiologic Characterization of the Weldon Spring, Missouri, Remedial Action Site*, UNC/GJ-HMWP-4; DOE/ID/12584-22, prepared by UNC Geotech, Inc., Grand Junction, Colo., for U.S. Department of Energy, Weldon Spring Site Remedial Action Project, Weldon Spring, Mo. (Feb.).

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1988a, *Phase I Chemical Soil Investigation Data Report for the Weldon Spring Chemical Plant/Raffinate Pits*, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn. (Jan.).

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1988b, *Proposed Interim Response Action #3, Material Staging Area*, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn. (Revision 0, July).

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1988c, *Buildings Characterization Sampling Plan, Weldon Spring Site*, DOE/OR/21548-021, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn. (Aug.).

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1988d, *Weldon Spring Site Remedial Action Project Chemical Soil Data Report to Support Interim Response Actions, Construction Staging Area and Administration Building*, DOE/OR/21548-051, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn. (Revision A, Nov.).

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1989a, *Radiological Sampling and Measurement Results for the Non-Process Related Buildings and Equipment*, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn. (March).

MK-Ferguson Company and Jacobs Engineering Group, Inc., 1989b, *Asbestos and Chemical Characterization Report for the Non-Process Related Buildings and Equipment*, prepared for U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn. (March).

Weichman, M.S., 1986, personal communication from M.S. Weichman (Chief, Review and Compliance, Division of Parks, Recreation, and Historic Preservation, Missouri Department of Natural Resources) to R.R. Nelson (Project Manager, Weldon Spring Site Remedial Action Project, Department of Energy, Oak Ridge Operations, Oak Ridge, Tenn.) (Nov. 3).

APPENDIX A:

POTENTIAL REQUIREMENTS FOR THE PROPOSED ACTION

TABLE A.1 Potential Location-Specific Requirements

Requirement	Citation	Content	Relationship to Proposed Action
Antiquity Act; Historic Sites Act	16 USC 431-433; 16 USC 461-467 40 CFR 6.301(a)	Cultural resources, such as historic buildings and sites and natural landmarks, must be preserved on federal land to avoid adverse impacts on such resources.	Not applicable or relevant and appropriate because no such resources exist in the affected area.
National Historic Preservation Act, as amended	16 USC 470 et seq. 40 CFR 6.301(b) 36 CFR 800	The effect of any federally assisted undertaking must be taken into account on any district, site, building, structure, or object included in or eligible for the *National Register of Historic Places*.	Not applicable or relevant and appropriate because no such inclusion or eligibility exists in the affected area (Weichman 1986).
Archeological and Historic Preservation Act	16 USC 469 40 CFR 6.301(c) (PL 93-291, 88 Stat. 174)	Prehistorical, historical, and archeological data that might be destroyed as a result of a federal, federally assisted, or federally licensed activity or program must be preserved.	Not applicable or relevant and appropriate because the affected area has been subjected to substantial previous disturbance during plant construction and operation activities.
Archeological Resources Protection Act	16 USC 470(a)	A permit must be obtained if an action on public or Indian lands could impact archeological resources	Not applicable or relevant and appropriate because the affected area has been subjected to substantial previous disturbance (Weichman 1986).

TABLE A.1 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
Endangered Species Act, as amended	16 USC 1531-1543 50 CFR 17.402 40 CFR 6.302(h)	Federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify any critical habitat.	Not applicable or relevant and appropriate because no designated critical habitat exists in the affected area, and endangered species that may inhabit the area (e.g., bald eagle) do so only intermittently.
Protection and Enhancement of the Cultural Environment	Exec. Order 11593 40 CFR 6.301	Historic, architectural, archeological, and cultural resources must be preserved, restored, and maintained, and must be evaluated for inclusion in the *National Register*.	Not applicable or relevant and appropriate because no such resources exist in the affected area.
Floodplain Management	Exec. Order 11988 40 CFR 6.302(b)	Federal agencies must avoid, to the maximum extent possible, any adverse impacts associated with direct and indirect development of a floodplain.	Not applicable or relevant and appropriate because the affected area is not located in a floodplain.

TABLE A.1 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
Protection of Wetlands	Exec. Order 11990 40 CFR 6.302(a)	Federal agencies must avoid, to the extent possible, any adverse impacts associated with the destruction or loss of wetlands and the support of new construction in wetlands if a practicable alternative exists.	Not applicable or relevant and appropriate because the affected area is not located in a wetland.

Source: Data from Vajda (1989).

TABLE A.2 Potential Contaminant-Specific Requirements

Requirement	Citation	Content	Relationship to Proposed Action
Clean Air Act, as amended; National Primary and Secondary Ambient Air Quality Standards	42 USC 7401-7642; 40 CFR 50	National Ambient Air Quality Standards are established for certain pollutants, including particulate matter (not to exceed a 24-hour average concentration of 150 $\mu g/m^3$ or an annual arithmetic mean of 50 $\mu g/m^3$. (See also National Emission Standards for Asbestos and Radionuclide Emissions.)	Applicable to decontamination, dismantlement, and temporary storage activities.
National Emission Standards for Radionuclide Emissions from Department of Energy Facilities	40 CFR 61, Subpart H	Air emissions of radionuclides other than radon-220 and radon-222 and their decay products from DOE facilities must not exceed an amount that causes a dose equivalent of 25 mrem/yr to the whole body or 75 mrem/yr to the critical organ of any member of the public.	Applicable to decontamination, dismantlement, and temporary storage activities.

TABLE A.2 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
National Emission Standard for Asbestos	40 CFR 61, Subpart M	Standards for asbestos removal associated with demolition and renovation operations are established. Warning signs must be posted, and discharge of visible emissions to the outside air must not occur during the collection, processing, packaging, transporting, or deposition of any asbestos-containing material generated by the source.	Applicable to asbestos-management activities.
Occupational Safety and Health Administration General Industry Standards	29 CFR 1910	Health and safety standards are established for hazardous waste operations, including limits for exposure to noise and certain hazardous materials. (See also discussion of 29 CFR 1910 in Table A.3.)	Applicable to specific exposure management activities (e.g., for noise) and general worker health and safety.

TABLE A.2 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
Occupational Safety and Health Administration Construction Industry Standards	29 CFR 1926	Health and safety standards are established for workers in the construction industry, including specific asbestos standards. Exposure of any employee to an airborne concentration of asbestos must not exceed 0.2 fiber/cm^3 air as an 8-hour time-weighted average, with an action level of 0.1 fiber/cm^3 air and a short-term (30-minute) limit of 1 fiber/cm^3 air (fibers >5 μm).	Applicable to asbestos-management activities and general worker health and safety.
Missouri Air Pollution Control Regulations and Air Quality Standards	10 CSR 10-1.010 to 10-6.140	Standards for particulate emissions and asbestos removal are identified (as for the Clean Air Act), and emissions of visible air contaminants -- e.g., from internal combustion engines -- are restricted.	Applicable to certain decontamination (including asbestos abatement), dismantlement, and temporary storage activities.
Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions	40 CFR 761	PCB storage and disposal requirements are established, and levels are specified for cleanup of PCB spills.[a]	Applicable to PCB-management activities.

TABLE A.2 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
Toxic Substances Control Act, as amended	15 USC 2601-2629 (PL 94-469, et seq.)	Inspection and testing requirements for PCB-contaminated materials are established.	Applicable to PCB-management activities.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	40 CFR 192	Permissible concentrations of radium, thorium, radon, and gamma radiation are limited.[b]	Although not applicable because the Weldon Spring site is not a uranium mill tailings site, certain of these requirements are relevant and appropriate to the proposed action because of contaminant similarities.
Radiation Protection Derived Concentration Guides	DOE Order 5480.1B (Chapter XI, as amended -- see Vaughan [1985] and subsequent updates of Derived Concentration Guides)	A basic dose limit is established for nonoccupationally exposed individuals: 100 mrem/yr committed effective dose equivalent above background. Further, all radiation exposures must be reduced to levels as low as reasonably achievable. In addition, derived concentration guides are identified for various contaminants in water and air, as are requirements for occupational exposure and on-site controls.	Although not promulgated, these constitute "to be considered" requirements for the proposed action.

TABLE A.2 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
Radiation Protection for Occupational Workers	DOE Order 5480.11	Standards and program requirements are established for worker protection from ionizing radiation, including derived air concentration guides for inhalation and immersion. Additionally, this order establishes that the basic dose limit of 100 mrem/yr (see DOE Order 5480.1B) also applies to any member of the public entering a controlled area.	Although not promulgated, these constitute "to be considered" requirements for the proposed action.
Standards for Protection Against Radiation	48 FR 20721	The standard for uranium-238 in inhaled air is 3×10^{-12} µCi/mL daily, 1×10^{-12} µCi/mL weekly, and 6×10^{-14} µCi/mL yearly; the standard for thorium-232 in inhaled air is 4×10^{-15} µCi/mL weekly and 8×10^{-15} µCi/mL yearly; the standard for thorium-230 in inhaled air is 2×10^{-14} µCi/mL yearly; and the standard for radium-225 in inhaled air is 9×10^{-13} µCi/mL weekly.	Although not promulgated, these constitute "to be considered" requirements for the proposed action.

TABLE A.2 (Cont'd)

[a]For low-concentration spills that involve less than 1 lb of PCBs by weight (less than 270 gal of untested mineral oil), all soil within the spill area (visible traces of oil and a buffer of 1 lateral foot around the visible traces) must be excavated, and the ground must be restored by backfilling with clean soil, i.e., soil containing less than 1 ppm PCBs. For high-concentration spills (≥ 500 ppm PCBs by weight or 50-500 ppm PCBs if ≥ 1 lb PCBs is involved) at outdoor electrical substations, solid surfaces must be cleaned to 100 μg/100 cm^2 and soil must either be cleaned to 25 ppm PCBs by weight or to 50 ppm PCBs by weight provided that the area is posted. For such spills at other restricted-access areas, high-contact solid surfaces must be cleaned to 10 μg/100 cm^2; low-contact, indoor solid surfaces must be cleaned to 10 μg/100 cm^2 or, for nonimpervious surfaces, to 100 μg/100 cm^2 and encapsulated (the regional administrator may disallow the encapsulation option if associated uncertainties pose special concerns at that spill site); low-contact, outdoor solid surfaces must be cleaned to 100 μg/100 cm^2; and soil must be cleaned to 25 ppm PCBs by weight. For nonrestricted-access areas, indoor solid surfaces and high-contact, outdoor solid surfaces must be cleaned to 10 μg/100 cm^2; low-contact, outdoor solid surfaces must be cleaned to 10 μg/100 cm^2 or, for nonimpervious surfaces, to 100 μg/100 cm^2 and encapsulated (the regional administrator may disallow this option, as above); and soil must be cleaned to 10 ppm PCBs by weight, provided that the soil is excavated to a minimum depth of 10 in., and the excavated soil must be replaced with clean soil -- i.e., soil containing less than 1 ppm PCBs.

[b]The soil concentration of radium or thorium averaged over an area of 100 m^2 must not exceed the background levels by more than 5 pCi/g averaged over the first 15 cm of soil below the surface and 15 pCi/g averaged over subsequent 15-cm layers. In any occupied or habitable building, the annual average (or equivalent) radon decay product concentration (including background) must not exceed 0.02 working level (WL) or a maximum of 0.03 WL. In any occupied or habitable building, the level of gamma radiation must not exceed the background level by more than 20 μR/h. Radon releases to the atmosphere from tailings piles must not exceed an average rate of 20 pCi/m^2-s or increase the annual average concentration in air outside the site by more than 0.5 pCi/L. Finally, the annual dose equivalent from sources other than radon and its short-lived decay products must not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ of any member of the general public.

Source: Data from Vajda (1989).

TABLE A.3 Potential Action-Specific Requirements

Requirement	Citation	Content	Relationship to Proposed Action
Comprehensive Environmental Response, Compensation, and Liability Act, as amended	42 USC 9601 (PL 96-510) et seq. (e.g., PL 99-499)	Authority and responsibility for implementing environmental response actions are identified, including procedural requirements.	Applicable to all aspects of the proposed action.
National Environmental Policy Act, as amended	42 USC 4231 (PL 91-190) et seq.	Consideration of environmental impacts is required at every stage of the process for making decisions and implementing actions that may affect the quality of the environment.	Applicable to all aspects of the proposed action.
Occupational Safety and Health Administration Standards for Hazardous Waste Operations and Emergency Response	29 CFR 1910	General worker protection requirements are established, as are requirements for worker training and the development of an emergency response plan and a safety and health program for employees. In addition, procedures are established for hazardous waste operations -- including decontamination, drum/container handling (e.g., for radioactive waste, asbestos, and PCBs), and shipping and transport.	Applicable to decontamination, dismantling, temporary storage, and off-site transport activities.

TABLE A.3 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
PCB Disposal Requirements	40 CFR 761.60	Disposal of PCBs with concentrations greater than 50 ppm must be in an incinerator or landfill that meets standards established in 40 CFR 761.70 and 761.75, respectively.	Applicable to off-site treatment/disposal of PCB-contaminated materials.
Hazardous Materials Transportation Act, as amended; Standards for Hazardous Waste Transporters	49 USC 1801-1812; 40 CFR 263, et seq.	Generic requirements are established for minimizing the environmental impacts of spills or releases of hazardous materials, as are procedures for transporting hazardous wastes.	Applicable to certain off-site disposal activities (e.g., for PCBs).
Solid Waste Disposal Act, as amended	42 USC 6901, et seq.	Disposal requirements are established for certain materials.	Applicable to certain off-site disposal activities.
Missouri Solid Waste Law; Missouri Solid Waste Rules	16 CSR 260.200 to 260.245; 10 CSR 80-1.010 to 80-6.	Policies and procedures are established for waste processing and disposal facilities, including sanitary and demolition landfills.	Applicable to certain off-site disposal activities.

TABLE A.3 (Cont'd)

Requirement	Citation	Content	Relationship to Proposed Action
Missouri Hazardous Substance Rules; Missouri Waste Management Law; Missouri Waste Management Rules	10 CSR 24-1.010 to 24-3.010; 16 CSR 260.350 to 260.550; 10 CSR 25-1.010 to 25-13.010	Requirements are established for the emergency reporting of hazardous substance releases, as are procedures for transportation and disposal of hazardous waste (including PCBs).	Applicable to certain off-site disposal activities (e.g., for PCBs).

Source: Data from Vajda (1989).

REFERENCES (Appendix A)

Vajda, G.F., 1989, *Position Paper, ARARs for WSSRAP Chemical Plant/Raffinate Pits Area*, prepared by Dames & Moore for U.S. Department of Energy, Weldon Spring Site Remedial Action Project, Weldon Spring, Missouri (March).

Vaughan, W.A., 1985, *Radiation Standards for Protection of the Public in the Vicinity of DOE Facilities*, memorandum from W.A. Vaughan (U.S. Department of Energy, Assistant Secretary for Environment, Safety and Health) to distribution (Aug. 5).

Weichman, M.S., 1986, personal communication from M.S. Weichman (Chief, Review and Compliance, Division of Parks, Recreation, and Historic Preservation, Missouri Department of Natural Resources) to R.R. Nelson (Project Manager, Weldon Spring Site Remedial Action Project, Department of Energy, Oak Ridge Operations, Oak Ridge, Tenn.) (Nov. 3).

APPENDIX B

DOE GUIDELINES FOR RESIDUAL RADIOACTIVE MATERIAL

APPENDIX B

DOE GUIDELINES FOR RESIDUAL RADIOACTIVE MATERIAL

[reproduced from U.S. Department of Energy, 1987, *U.S. Department of Energy Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites (Revision 2, March 1987)*]

A. INTRODUCTION

This document presents U.S. Department of Energy (DOE) radiological protection guidelines for cleanup of residual radioactive material and management of the resulting wastes and residues. It is applicable to sites identified by the Formerly Utilized Sites Remedial Action Program (FUSRAP) and remote sites identified by the Surplus Facilities Management Program (SFMP).* The topics covered are basic dose limits, guidelines and authorized limits for allowable levels of residual radioactive material, and requirements for control of the radioactive wastes and residues.

Protocols for identification, characterization, and designation of FUSRAP sites for remedial action; for implementation of the remedial action; and for certification of a FUSRAP site for release for unrestricted use are given in a separate document (U.S. Department of Energy 1986) and subsequent guidance. More detailed information on applications of the guidelines presented herein, including procedures for deriving site-specific guidelines for allowable levels of residual radioactive material from basic dose limits, is contained in "A Manual for Implementing Residual Radioactive Material Guidelines" (U.S. Department of Energy 1987), referred to herein as the "supplement".

"Residual radioactive material" is used in these guidelines to describe radioactive material derived from operations or sites over which DOE has authority. Guidelines or guidance to limit the levels of radioactive material and to protect the public and the environment are provided for (1) residual concentrations of radionuclides in soil,** (2) concentrations of airborne

*A remote SFMP site is one that is excess to DOE programmatic needs and is located outside a major operating DOE research and development or production area.

**"Soil" is defined herein as unconsolidated earth material, including rubble and debris that may be present in earth material.

radon decay products, (3) external gamma radiation levels, (4) surface contamination levels, and (5) radionuclide concentrations in air or water resulting from or associated with any of the above.

A "basic dose limit" is a prescribed standard from which limits for quantities that can be monitored and controlled are derived; it is specified in terms of the effective dose equivalent as defined by the International Commission on Radiological Protection (ICRP 1977, 1978). The basic dose limits are used for deriving guidelines for residual concentrations of radionuclides in soil. Guidelines for residual concentrations of thorium and radium in soil, concentrations of airborne radon decay products, allowable indoor external gamma radiation levels, and residual surface contamination concentrations are based on existing radiological protection standards (U.S. Environmental Protection Agency 1983; U.S. Nuclear Regulatory Commission 1982; and DOE Departmental Orders). Derived guidelines or limits based on the basic dose limits for those quantities are used only when the guidelines provided in the existing standards cited above are shown to be inappropriate.

A "guideline" for residual radioactive material is a level of radioactivity or radioactive material that is acceptable if use of the site is to be unrestricted. Guidelines for residual radioactive material presented herein are of two kinds: (1) generic, site-independent guidelines taken from existing radiation protection standards and (2) site-specific guidelines derived from basic dose limits using site-specific models and data. Generic guideline values are presented in this document. Procedures and data for deriving site-specific guideline values are given in the supplement. The basis for the guidelines is generally a presumed worst-case plausible-use scenario for the site.

An "authorized limit" is a level of residual radioactive material or radioactivity that must not be exceeded if the remedial action is to be considered completed and the site is to be released for unrestricted use. The authorized limits for a site will include (1) limits for each radionuclide or group of radionuclides, as appropriate, associated with residual radioactive material in soil or in surface contamination of structures and equipment, (2) limits for each radionuclide or group of radionuclides, as appropriate, in air or water, and, (3) where appropriate, a limit on external gamma radiation resulting from the residual material. Under normal circumstances, expected to occur at most sites, authorized limits for residual radioactive material or radioactivity are set equal to guideline values. Exceptional conditions for which authorized limits might differ from guideline values are specified in Sections D and F of this document. A site may be released for unrestricted use only if site conditions do not exceed the authorized limits or approved supplemental limits, as defined in Section F.1, at the time remedial action is completed. Restrictions and controls on use of the site must be established and enforced if site conditions exceed the approved limits, or if there is potential to exceed the basic dose limit if use of the site is not restricted (Section F.2). The applicable controls and restrictions are specified in Section E.

DOE policy requires that all exposures to radiation be limited to levels that are as low as reasonably achievable (ALARA). For sites to be released for unrestricted use, the intent is to reduce residual radioactive material to levels that are as far below authorized limits as reasonable considering technical, economic, and social factors. At sites where the residual material is not reduced to levels that permit release for unrestricted use, ALARA policy is implemented by establishing controls to reduce exposure to levels that are as low as reasonably achievable. Procedures for implementing ALARA policy are discussed in the supplement. ALARA policies, procedures, and actions shall be documented and filed as a permanent record upon completion of remedial action at a site.

B. BASIC DOSE LIMITS

The basic limit for the annual radiation dose received by an individual member of the general public is 100 mrem/yr. The internal committed effective dose equivalent, as defined in ICRP Publication 26 (ICRP 1977) and calculated by dosimetry models described in ICRP Publication 30 (ICRP 1978), plus the dose from penetrating radiation sources external to the body, shall be used for determining the dose. This dose shall be described as the "effective dose equivalent". Every effort shall be made to ensure that actual doses to the public are as far below the basic dose limit as is reasonably achievable.

Under unusual circumstances, it will be permissible to allow potential doses to exceed 100 mrem/yr where such exposures are based upon scenarios that do not persist for long periods and where the annual lifetime exposure to an individual from the subject residual radioactive material would be expected to be less than 100 mrem/yr. Examples of such situations include conditions that might exist at a site scheduled for remediation in the near future or a possible, but improbable, one-time scenario that might occur following remedial action. These levels should represent doses that are as low as reasonably achievable for the site. Further, no annual exposure should exceed 500 mrem.

C. GUIDELINES FOR RESIDUAL RADIOACTIVE MATERIAL

C.1 Residual Radionuclides in Soil

Residual concentrations of radionuclides in soil shall be specified as above-background concentrations averaged over an area of 100 m^2. Generic guidelines for thorium and radium are specified below. Guidelines for residual concentrations of other radionuclides shall be derived from the basic dose limits by means of an environmental pathway analysis using site-specific data where available. Procedures for these derivations are given in the supplement.

If the average concentration in any surface or below-surface area less than or equal to 25 m^2 exceeds the authorized limit or guideline by a factor of $(100/A)^{1/2}$, where A is the area of the elevated region in square meters, limits for "hot spots" shall also be applicable. Procedures for calculating these hot spot limits, which depend on the extent of the elevated local concentrations, are given in the supplement. In addition, every reasonable effort shall be made to remove any source of radionuclide that exceeds 30 times the appropriate limit for soil, irrespective of the average concentration in the soil.

Two types of guidelines are provided, generic and derived. The generic guidelines for residual concentrations of Ra-226, Ra-228, Th-230, and Th-232 are:

- 5 pCi/g, averaged over the first 15 cm of soil below the surface

- 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface

These guidelines take into account ingrowth of Ra-226 from Th-230 and of Ra-228 from Th-232, and assume secular equilibrium. If either Th-230 and Ra-226 or Th-232 and Ra-228 are both present, not in secular equilibrium, the appropriate guideline is applied as a limit to the radionuclide with the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that (1) the dose for the mixtures will not exceed the basic dose limit or (2) the sum of the ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1 ("unity"). Explicit formulas for calculating residual concentration guidelines for mixtures are given in the supplement.

C.2 Airborne Radon Decay Products

Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property that are intended for unrestricted use; structures that will be demolished or buried are excluded. The applicable generic guideline (40 CFR Part 192) is: In any occupied or habitable building, the objective of remedial action shall be, and a reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL.* In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Remedial actions by DOE are not required in order to comply with this guideline when there is reasonable assurance that residual radioactive material is not the cause.

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*A working level (WL) is any combination of short-lived radon decay products in one liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha energy.

C.3 External Gamma Radiation

The average level of gamma radiation inside a building or habitable structure on a site to be released for unrestricted use shall not exceed the background level by more than 20 μR/h and shall comply with the basic dose limit when an appropriate-use scenario is considered. This requirement shall not necessarily apply to structures scheduled for demolition or to buried foundations. External gamma radiation levels on open lands shall also comply with the basic dose limit, considering an appropriate-use scenario for the area.

C.4 Surface Contamination

The generic surface contamination guidelines provided in Table 1 are applicable to existing structures and equipment. These guidelines are adapted from standards of the U.S. Nuclear Regulatory Commission (NRC 1982)* and will be applied in a manner that provides a level of protection consistent with the Commission's guidance. These limits apply to both interior and exterior surfaces. They are not directly intended for use on structures to be demolished or buried, but should be applied to equipment or building components that are potentially salvageable or recoverable scrap. If a building is demolished, the guidelines in Section C.1 are applicable to the resulting contamination in the ground.

C.5 Residual Radionuclides in Air and Water

Residual concentrations of radionuclides in air and water shall be controlled to levels required by DOE Environmental Protection Guidance and Orders, specifically DOE Order 5480.1A and subsequent guidance. Other Federal and/or state standards shall apply when they are determined to be appropriate.

D. AUTHORIZED LIMITS FOR RESIDUAL RADIOACTIVE MATERIAL

Authorized limits shall be established to (1) ensure that, as a minimum, the basic dose limits specified in Section B will not be exceeded under the worst-case plausible-use scenario consistent with the procedures and guidance provided or (2) be consistent with applicable generic guidelines, where such guidelines are provided. The authorized limits for each site and its vicinity properties shall be set equal to the generic or derived guidelines except where it can be clearly established on the basis of site-specific data -- including health, safety, and socioeconomic considerations -- that the guidelines are not appropriate for use at the specific site. Consideration should also be given to ensure that the limits comply with or provide a level of protection equivalent to other appropriate limits and guidelines (i.e., state or

*These guidelines are functionally equivalent to Section 4 -- Decontamination for Release for Unrestricted Use -- of NRC Regulatory Guide 1.86 (U.S. Atomic Energy Commission 1974), but they are applicable to non-reactor facilities.

TABLE 1 SURFACE CONTAMINATION GUIDELINES

Radionuclides[b]	Allowable Total Residual Surface Contamination (dpm/100 cm^2)[a]		
	Average[c,d]	Maximum[d,e]	Removable[d,f]
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000 α	15,000 α	1,000 α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 β-γ	15,000 β-γ	1,000 β-γ

[a] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[b] Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[c] Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[d] The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

[e] The maximum contamination level applies to an area of not more than 100 cm^2.

[f] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. The numbers in this column are maximum amounts.

other Federal). Documentation supporting such a decision should be similar to that required for supplemental limits and exceptions (Section F), but should be generally more detailed because the documentation covers the entire site.

. Remedial action shall not be considered complete unless the residual radioactive material levels comply with the authorized limits. The only exception to this requirement will be for those special situations where the supplemental limits or exceptions are applicable and approved as specified in Section F. However, the use of supplemental limits and exceptions should be considered only if it is clearly demonstrated that it is not reasonable to decontaminate the area to the authorized limit or guideline value. The authorized limits are developed through the project offices in the field and are approved by the headquarters program office.

E. CONTROL OF RESIDUAL RADIOACTIVE MATERIAL AT FUSRAP AND REMOTE SFMP SITES

Residual radioactive material above the guidelines at FUSRAP and remote SFMP sites must be managed in accordance with applicable DOE Orders. The DOE Order 5480.1A and subsequent guidance or superceding Orders require compliance with applicable Federal and state environmental protection standards.

The operational and control requirements specified in the following DOE Orders shall apply to interim storage, interim management, and long-term management.

a. 5000.3, Unusual Occurrence Reporting System

b. 5440.1C, Implementation of the National Environmental Policy Act

c. 5480.1A, Environmental Protection, Safety, and Health Protection Program for DOE Operations, as revised by DOE 5480.1 change orders and the 5 August 1985 memorandum from Vaughan to Distribution

d. 5480.2, Hazardous and Radioactive Mixed Waste Management

e. 5480.4, Environmental Protection, Safety, and Health Protection Standards

f. 5482.1A, Environmental, Safety, and Health Appraisal Program

g. 5483.1A, Occupational Safety and Health Program for Government-Owned Contractor-Operated Facilities

h. 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements

i. 5820.2, Radioactive Waste Management

E.1 Interim Storage

a. Control and stabilization features shall be designed to ensure, to the extent reasonably achievable, an effective life of 50 years and, in any case, at least 25 years.

b. Above-background Rn-222 concentrations in the atmosphere above facility surfaces or openings shall not exceed (1) 100 pCi/L at any given point, (2) an annual average concentration of 30 pCi/L over the facility site, and (3) an annual average concentration of 3 pCi/L at or above any location outside the facility site (DOE Order 5480.1A, Attachment XI-1).

c. Concentrations of radionuclides in the groundwater or quantities of residual radioactive material shall not exceed existing Federal or state standards.

d. Access to a site shall be controlled and misuse of on-site material contaminated by residual radioactive material shall be prevented through appropriate administrative controls and physical barriers -- active and passive controls as described by the U.S. Environmental Protection Agency (1983--p. 595). These control features should be designed to ensure, to the extent reasonable, an effective life of at least 25 years. The Federal government shall have title to the property or shall have a long-term lease for exclusive use.

E.2 Interim Management

a. A site may be released under interim management when the residual radioactive material exceeds guideline values if the residual radioactive material is in inaccessible locations and would be unreasonably costly to remove, provided that administrative controls are established to ensure that no member of the public shall receive a radiation dose exceeding the basic dose limit.

b. The administrative controls, as approved by DOE, shall include but not be limited to periodic monitoring as appropriate, appropriate shielding, physical barriers to prevent access, and appropriate radiological safety measures during maintenance, renovation, demolition, or other activities that might disturb the residual radioactive material or cause it to migrate.

c. The owner of the site or appropriate Federal, state, or local authorities shall be responsible for enforcing the administrative controls.

E.3 Long-Term Management

Uranium, Thorium, and Their Decay Products

a. Control and stabilization features shall be designed to ensure, to the extent reasonably achievable, an effective life of 1,000 years and, in any case, at least 200 years.

b. Control and stabilization features shall be designed to ensure that Rn-222 emanation to the atmosphere from the wastes shall not (1) exceed an annual average release rate of 20 $pCi/m^2/s$ and (2) increase the annual average Rn-222 concentration at or above any location outside the boundary of the contaminated area by more than 0.5 pCi/L. Field verification of emanation rates is not required.

c. Prior to placement of any potentially biodegradable contaminated wastes in a long-term management facility, such wastes shall be properly conditioned to ensure that (1) the generation and escape of biogenic gases will not cause the requirement in paragraph b. of this section (E.3) to be exceeded and (2) biodegradation within the facility will not result in premature structural failure in violation of the requirements in paragraph a. of this section (E.3).

d. Groundwater shall be protected in accordance with appropriate Departmental Orders and Federal and state standards, as applicable to FUSRAP and remote SFMP sites.

e. Access to a site should be controlled and misuse of on-site material contaminated by residual radioactivity should be prevented through appropriate administrative controls and physical barriers -- active and passive controls as described by the U.S. Environmental Protection Agency (1983--p. 595). These controls should be designed to be effective to the extent reasonable for at least 200 years. The Federal government shall have title to the property.

Other Radionuclides

f. Long-term management of other radionuclides shall be in accordance with Chapters 2, 3, and 5 of DOE Order 5820.2, as applicable.

F. SUPPLEMENTAL LIMITS AND EXCEPTIONS

If special site-specific circumstances indicate that the guidelines or authorized limits established for a given site are not appropriate for a portion of that site or for a vicinity property, then the field office may request that supplemental limits or an exception be applied. In either case, the field office must justify that the subject guidelines or authorized limits are not appropriate and that the alternative action will provide adequate protection, giving due consideration to health and safety, the environment, and costs. The field office shall obtain approval for specific supplemental limits or exceptions from headquarters as specified in Section D of these guidelines and shall provide to headquarters those materials required for the justification as specified in this section (F) and in the FUSRAP and SFMP protocols and subsequent guidance documents. The field office shall also be responsible for coordination with the state or local government of the limits or exceptions and associated restrictions as appropriate. In the case of exceptions, the field office shall also work with the state and/or local governments to ensure that restrictions or conditions of release are adequate and mechanisms are in place for their enforcement.

F.1 Supplemental Limits

The supplemental limits must achieve the basic dose limits set forth in this guideline document for both current and potential unrestricted uses of a site and/or vicinity property. Supplemental limits may be applied to a vicinity property or a portion of a site if, on the basis of a site-specific analysis, it is determined that (1) certain aspects of the vicinity property or portion of the site were not considered in the development of the established authorized limits and associated guidelines for that vicinity property or site and, (2) as a result of these unique characteristics, the established limits or guidelines either do not provide adequate protection or are unnecessarily restrictive and costly.

F.2 Exceptions

Exceptions to the authorized limits defined for unrestricted use of a site or vicinity property may be applied to a vicinity property or a portion of a site when it is established that the authorized limits cannot be achieved and restrictions on use of the vicinity property or portion of the site are necessary to provide adequate protection of the public and the environment. The field office must clearly demonstrate that the exception is necessary and that the restrictions will provide the necessary degree of protection and will comply with the requirements for control of residual radioactive material as set forth in Section E of these guidelines.

F.3 Justification for Supplemental Limits and Exceptions

Supplemental limits and exceptions must be justified by the field office on a case-by-case basis using site-specific data. Every effort should be made to minimize use of the supplemental limits and exceptions. Examples of specific situations that warrant use of the supplemental standards and exceptions are:

a. Where remedial action would pose a clear and present risk of injury to workers or members of the general public, notwithstanding reasonable measures to avoid or reduce risk.

b. Where remedial action -- even after all reasonable mitigative measures have been taken -- would produce environmental harm that is clearly excessive compared to the health benefits to persons living on or near affected sites, now or in the future. A clear excess of environmental harm is harm that is long-term, manifest, and grossly disproportionate to health benefits that may reasonably be anticipated.

c. Where it is clear that the scenarios or assumptions used to establish the authorized limits do not, under plausible current or future conditions, apply to the property or portion of the site identified and where more appropriate scenarios or assumptions indicate that other limits are applicable or necessary for protection of the public and the environment.

d. Where the cost of remedial action for contaminated soil is unreasonably high relative to long-term benefits and where the residual radioactive material does not pose a clear present or future risk after taking necessary control measures. The likelihood that buildings will be erected or that people will spend long periods of time at such a site should be considered in evaluating this risk. Remedial action will generally not be necessary where only minor quantities of residual radioactive material are involved or where residual radioactive material occurs in an inaccessible location at which site-specific factors limit their hazard and from which they are costly or difficult to remove. Examples include residual radioactive material under hard-surface public roads and sidewalks, around public sewer lines, or in fence-post foundations. A site-specific analysis must be provided to establish that it would not cause an individual to receive a radiation dose in excess of the basic dose limits stated in Section B, and a statement specifying the level of residual radioactive material must be included in the appropriate state and local records.

e. Where there is no feasible remedial action.

G. SOURCES

Limit or Guideline	Source
Basic Dose Limits	
Dosimetry model and dose limits	International Commission on Radiological Protection (1977, 1978)
Generic Guidelines for Residual Radioactivity	
Residual concentrations of radium and thorium in soil	40 CFR Part 192
Airborne radon decay products	40 CFR Part 192
External gamma radiation	40 CFR Part 192
Surface contamination	Adapted from U.S. Nuclear Regulatory Commission (1982)
Control of Radioactive Wastes and Residues	
Interim storage	DOE Order 5480.1A and subsequent guidance
Long-term management	DOE Order 5480.1A and subsequent guidance; 40 CFR Part 192; DOE Order 5820.2

H. REFERENCES

International Commission on Radiological Protection, 1977. Recommendations of the International Commission on Radiological Protection (Adopted January 17, 1977). ICRP Publication 26. Pergamon Press, Oxford. [As modified by "Statement from the 1978 Stockholm Meeting of the ICRP." Annals of the ICRP, Vol. 2, No. 1, 1978.]

International Commission on Radiological Protection, 1978. Limits for Intakes of Radionuclides by Workers. A Report of Committee 2 of the International Commission on Radiological Protection. Adopted by the Commission in July 1978. ICRP Publication 30. Part 1 (and Supplement), Part 2 (and Supplement), Part 3 (and Supplements A and B), and Index. Pergamon Press, Oxford.

U.S. Atomic Energy Commission, 1974. Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors. June 1974.

U.S. Department of Energy, 1986. Formerly Utilized Sites Remedial Action Program. Summary Protocol: Identification - Characterization - Designation - Remedial Action - Certification. Office of Nuclear Energy, Office of Terminal Waste Disposal and Remedial Action, Division of Remedial Action Projects. January 1986.

U.S. Department of Energy, 1987. Supplement to U.S. Department of Energy Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites. A Manual for Implementing Residual Radioactive Material Guidelines. Prepared by Argonne National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest Laboratory for the U.S. Department of Energy. [In press.]

U.S. Environmental Protection Agency, 1983. Standards for Remedial Actions at Inactive Uranium Processing Sites; Final Rule (40 CFR Part 192). Federal Register 48(3):590-604 (January 5, 1983).

U.S. Nuclear Regulatory Commission, 1982. Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material. Division of Fuel Cycle and Material Safety, Washington, D.C. July 1982.

APPENDIX C

ENGLISH/METRIC - METRIC/ENGLISH EQUIVALENTS

TABLE C.1 English/Metric Equivalents

Multiply	By	To obtain
acres	0.4047	hectares (ha)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
pounds (lb)	0.4536	kilograms (kg)
square feet (ft^2)	0.09290	square meters (m^2)

TABLE C.2 Metric/English Equivalents

Multiply	By	To obtain
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	tons, short (t)
kilometers (km)	0.6214	miles (mi)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
square meters (m^2)	10.76	square feet (ft^2)